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START2Superfund Technical Assessment and Response Team 2 -
Region VIIIUnited States
Environmental Protection Agency

Contract No. 68-W-00-118

REMOVAL SUMMARY REPORT**SUPERIOR WASTE ROCK (ROS)**
Superior, Mineral County, Montana

TDD No. 0208-0002

COPY

DECEMBER 3, 2002

**URS**

OPERATING SERVICES, INC.

In association with: Tetra Tech EM, Inc.
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LT Environmental, Inc.
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URS OPERATING SERVICES

1099 18TH STREET
SUITE 710
DENVER, COLORADO 80202-1908
TEL: (303) 296-3523
FAX: (303) 291-8296

December 3, 2002

Mr. Tien Nguyen
On-Scene Coordinator
U.S. Environmental Protection Agency, Region VIII
999 18th Street, Suite 500, Mail Code: 8EPR-ER
Denver, Colorado 80202

**SUBJECT: START, EPA Region VIII, Contract No. 68-W-00-118, TDD No. 0208-0002
Removal Summary Report - Superior Waste Rock, Superior, Mineral County,
Montana**

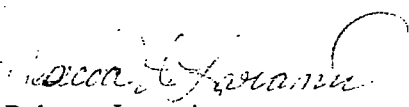
Dear Tien:

Enclosed are two copies of the final Removal Summary Report for the Superior Waste Rock (ROS) site, Superior, Mineral County, Montana. Sampling activities were completed August 19 through August 30, 2002. This document is submitted for your review and approval.

If you have any questions, please call me at 303-291-8229.

Very truly yours,

URS OPERATING SERVICES, INC.



Rebecca Laramie
Environmental Engineer

attachments

cc: T. F. Staible/UOS without attachments
File/UOS

REMOVAL SUMMARY REPORT

SUPERIOR WASTE ROCK (ROS) Superior, Mineral County, Montana

EPA Contract No. 68-W-00-118
TDD No. 0208-0002

Prepared By:
Rebecca Laramie
Environmental Engineer

URS Operating Services, Inc.
1099 18th Street, Suite 710
Denver, CO 80202-1908

Approved: _____
Tien Nguyen, On-Scene Coordinator, EPA, Region VIII

Date: _____

Approved: TF Staible
T. F. Staible, START2 Program Manager, UOS

Date: 2 Dec 02

Approved: Rebecca Laramie
Rebecca Laramie, Environmental Engineer, UOS

Date: 12/02/02

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**REMOVAL SUMMARY REPORT
Superior Waste Rock (ROS)
Superior, Mineral County, Montana**

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1.0 INTRODUCTION

The URS Operating Services, Inc. (UOS) Superfund Technical Assessment and Response Team (START2) was tasked by the U.S. Environmental Protection Agency (EPA), Region VIII, under Technical Direction Document (TDD) #0208-0002, to conduct environmental sampling in Superior, Montana, as part of removal activities. The removal activities and sampling were completed between August 19 and August 30, 2002. This report describes the field activities completed and the analytical results associated with the removal activities.

During June 2002, soil samples were collected from 64 residential properties, 20 right-of-ways, and 10 city/county and open space properties within and around Superior, Montana, as part of a removal assessment. Soil samples were field analyzed using an X-Ray Fluorescence Spectrometer (XRF) with 10% of the samples being sent to a commercial laboratory for confirmation analysis. Five samples were also laboratory analyzed for lead and arsenic speciation and relative bioavailability estimates. Using the analytical results, EPA established health-based risk benchmarks of 3,000 parts per million (ppm) for lead and 400 ppm for arsenic. Based on these benchmarks, removal activities were conducted at three residential driveways, three right-of-ways, the high school track, and the county fairgrounds during August 2002. START2 tasks included collecting post-removal soil samples at the base of each excavation, completing a bench scale stabilization test, and documenting activities during the removal.

Soil samples collected during the removal activities were field analyzed with an XRF for metals. Approximately 10% of these soil samples were also sent to a commercial laboratory for confirmation analysis of target analyte list (TAL) metals. In addition, Toxicity Characteristic Leaching Procedure (TCLP) analysis for metals was performed on representative samples from the stockpiled waste material and from bench scale stabilization tests. Confirmation sample results and TCLP sample results were validated in accordance with the criteria contained in EPA guidance documents modified for the analytical method used (U.S. Environmental Protection Agency (EPA) 1994a).

2.0 OBJECTIVES

The goal of the sampling activities is to document the post-removal concentrations of metals at the base of each excavation. Samples were also collected from the waste material to determine proper stabilization and/or disposal methods for the stockpiled waste material.

3.0 SITE HISTORY AND PREVIOUS WORK

The Superior Waste Rock site includes residential areas in or around Superior, Montana, that were affected by tailings and waste rock from The Iron Mountain Mine and Mill. The Iron Mountain Mine and Mill is located approximately 3.5 miles north of Superior. The Iron Mountain Mine and Mill operated from 1909 to 1930 and again from 1947 to 1953 (Montana Department of Environmental Quality (Montana DEQ) 2001). The present owner, ASARCO of Wallace, Idaho, acquired the property around 1916. The mine has been abandoned since 1954 and foundations are all that remain of the mill and other mining buildings. When operating, the mill site consisted of a 200-ton mill and approximately 500 feet of tunnels (Montana Department of State Lands - Abandoned Mine Reclamation Bureau (MDSL-AMRB) 1993). The mill operation processed silver, gold, lead, copper, and zinc ores (Montana DEQ 2001). The mill also accepted ore from the Dillon Mill and the Belle of the Hills Mine, which were located upgradient of the Iron Mountain Mill site. It is believed that the Iron Mountain Mill used flotation methods to separate the metals. Although the waste rock pile still remains on site, most of the tailings were washed down onto the Flat Creek floodplain (MDSL-AMRB 1993). Previous START2 sampling activities indicate that a portion of the tailings from the Iron Mountain Mill was used as fill in the town of Superior (URS Operating Services, Inc. (UOS) 2002a).

During 1993, the Montana Department of State Lands, Abandoned Mine Reclamation Bureau (MDSL-AMRB) conducted an abandoned mine investigation to determine the potential health and environmental risks associated with the Iron Mountain Mine and Mill site. The Abandoned Hardrock Mine Priority Sites Summary Report documents concentrations of arsenic, copper, mercury, lead, zinc, cadmium, manganese, and antimony at the mill site at more than three times the background sample concentration (MDSL-AMRB 1993).

In 1998, reclamation activities were conducted by ASARCO, the current owner of the mill site. These activities consisted of removing some tailings from Flat Creek and placing them on the ASARCO property (Iron Mountain Mine) in an impoundment. The impoundment was covered with topsoil and vegetated (ASARCO 1999). Additional tailings along Flat Creek were revegetated in place (UOS 2001b). No sampling data were available for Flat Creek following the ASARCO removal activities. Sample results from the most recent and complete monitoring conducted in 1997 are included in the Preliminary Assessment (PA) report prepared by START2 (UOS 2001a).

During 2001, Region VIII EPA conducted a PA/Site Investigation at the Iron Mountain Mill site. START2 collected 44 environmental samples as part of the SI during October 2001. Eleven soil samples were collected from the high school track and residential properties in Superior. Soil samples collected from the high school track indicated elevated concentrations of metals including lead and arsenic. Samples collected from a residential property and a right-of-way in a residential neighborhood also indicated elevated concentrations of lead and arsenic. Because of these results, the Region VIII EPA tasked START2 to collect additional samples from the town of Superior as part of a removal assessment.

During June 2002, additional sampling activities were conducted by START2 to further delineate areas in Superior where tailings were used as fill material. Samples were collected and field analyzed from a total of 64 residential properties, 20 right-of-ways, and 10 city/county and open space properties within and around Superior, Montana (UOS 2002/SAR). Five samples were also laboratory analyzed for lead and arsenic speciation and relative bioavailability estimates. These samples were used to determine areas requiring the removal activities discussed in this report.

4.0 SITE ACTIVITIES AND OBSERVATIONS

Removal activities were conducted on three residential driveways, three right-of-ways, the high school track, and the county fairgrounds (Photos 6 through 13). Environmental Restoration L.L.C completed the removal activities, which consisted of excavating the contaminated material, stockpiling the material at the staging area, and backfilling the excavated area using predetermined fill. The staging area was located at the county airport and consisted of two stockpiles. Stockpile A contained material that visually appeared contaminated (Photo 14) and stockpile B contained material that visually appeared clean (Photo 15). Both stockpiles were lined and covered with visqueen to prevent dispersion of the contaminants. START2 was tasked to document activities during the removal, to collect samples at the base of each excavation, to collect samples from each stockpile at the staging area, and to complete a bench scale stabilization test on the excavated material.

START2 field operations were conducted as described below, in accordance with the EPA Region VIII Residential Soil Lead Sampling Guidance Document, START2 Technical Standard Operating Procedures (TSOPs), the UOS Field Samplers Guide, and the site specific Health and Safety Plan (EPA 2000; UOS 2000; UOS 1998; UOS 2002b). Sampling activities were conducted in level D personal protective equipment (PPE).

4.1 SAMPLING ACTIVITIES AND SAMPLE IDENTIFICATION

All samples were collected with dedicated disposable plastic scoops. Sample identifiers were written on each sample container with waterproof ink along with the date and time of sample collection. Sample identifiers, sample date and time, and the location of each sample were also documented in field log book at the time of sample collection.

4.1.1 Post Removal Samples

Post removal samples were collected after each excavation of contaminated material to document metals concentrations at the base of the excavation. In small areas of excavation (right-of-ways and residential driveways) one composite sample was collected as a representative sample for the area. In larger areas (the high school track and fairgrounds) the excavated area was divided into sections and a composite sample was collected from each section. Each sample was homogenized before analysis. All post removal samples were analyzed using the Spectrace XRF with 10% of samples being sent to a commercial laboratory for confirmation analysis. Sample results from the XRF are listed in Table 1. Table 1 also lists the removal assessment results collected in the excavated areas before excavation occurred. These results delineated the areas for removal actions.

Residential samples were identified based on the area sampled. Samples had similar designations to the samples collected during the removal assessment samples. Samples were designated as follows. The first field is the letter "S" that designates the sampling event as Superior Waste Rock site. The second field is the four digit house number. The third field is two letters that represent the street on which the property is located (Appendix D). The fourth field is the section or zone number (most sample locations are considered zone 1). The fifth field indicates that the sample is a post excavation sample (Z) and the number of samples collected from that zone (1,2,3). The last field indicates if the sample is a replicate (R), duplicate (D), or equipment blank (B) sample. If the last field is null, the sample is not a field quality control sample.

Street right-of-way samples were labeled similarly to the residential samples except that the house number was replaced with the block number, and the section number was replaced

with the letter N, S, E, or W to denote the right-of-way direction. The high school track samples were labeled with S0400HT followed by the zone number (the track was zone 4), a Z to signify post excavation samples, and a number (1 through 12) to designate the number of samples collected. Finally, the fairground samples were labeled with S700FG1 to signify the fairgrounds, followed by a Z to signify post excavation samples, and a number (1 through 2) to designate the number of samples collected.

4.1.2 Stockpile and Stabilization Samples

Material excavated during removal activities was placed in two separate stockpiles based on visual observations. Red material that appeared to be tailings was placed in Stockpile A. This material was typically from the surface of the excavation. Material that appeared more natural was placed in Stockpile B. Once all excavation was completed, a composite sample was collected from each stockpile to determine if metals concentrations were above their respective TCLP regulatory levels for disposal.

Material composited from stockpile A was also used to complete a bench scale test for stabilization of leachable metals. This material was used because it was likely to have the highest concentrations of metals. The bench scale test used varying amounts of Portland cement to stabilize the metals in the tailings. Specifically, 7%, 10%, 15%, and 20% cement by weight was added to the material collected from stockpile A. Each mixture was homogenized and then mixed with water. The total mixture was allowed to cure for 24 hours before a sample was collected from each stabilization option. Samples were sent to a commercial laboratory for TCLP analysis and were compared to analysis from a control sample with no cement added to the material. The exact procedure for the bench scale test is described in Appendix E. Results are presented in Table 4.

Stockpile samples were labeled with the designation S0STKPLA or S0STKPLB to identify the stockpile, followed by a number representing the number of samples collected from the stockpile. Stabilization samples were designated with similar labels; however, the number representing the number of samples was changed to represent the percentage of cement added to the material (00 for 0%, 07 for 7%, etc.). All stabilization samples consisted of material from Stockpile A. The last field for both stockpile and stabilization samples

indicates if the sample is a replicate (R), duplicate (D), or equipment blank (B) sample. If the last field is null, the sample is not a field quality control sample.

4.1.3 Miscellaneous Samples

During removal activities, several samples were collected that were not classified as post removal samples or stabilization/stockpile samples. Several samples were collected from potential clean fill material. These samples are labeled with S0FILL and a letter to distinguish each supplier and a number to distinguish the pile of fill sampled. Samples were also collected from the staging area before it was disturbed to document background concentrations. These samples are labeled S0STGAR with a letter to distinguish each sample. Finally ten samples were collected to further delineate contaminated areas or to test for the presence of elevated metals in areas that had not been tested previously. These samples are identified using the same methods as those used during the removal assessment and are classified in Table 2 as Assessment samples.

Specifically, two samples were collected from a residential property located at the northeast corner of Flat Creek Road and Cemetery Road. These samples were collected as supplemental samples to one sample collected from the same property during the removal assessment conducted in June 2002. Sample S00FCCM1S2 was collected from the front portion of the property. Sample S00FCCM2S1 was collected along Flat Creek near the property. Two samples were also collected at a separate residential property located on the west side of Flat Creek Road and north of the corner of Flat Creek and Cemetery Road. Sample S0041FC1S1 was collected in the front yard of the property and sample S0041FC1S2 was collected in the back yard of the property. Both properties are owned by the same person and were sampled under the address 41 Flat Creek Road. The sample identifier was modified for the property at the intersection of Flat Creek Road and Cemetery Road to distinguish between the properties. While both of these properties had residential structures, during sampling activities both houses were vacant.

Samples S0400HT1S2; S0407IH1A1; S0700FC1A13, S0700FGA6, and F0700FGA3 were collected from the high school track, 407 Iron Mountain Heights, and the fairgrounds respectively. All of these properties had been previously sampled and removal activities

were deemed necessary. The previously mentioned samples were collected to further delineate the contaminated material present at each site.

Sample S0401SP1S1 was collected from a property that had not previously been sampled. Property owners at 401 Spruce Street requested the EPA to conduct sampling on their driveway where material appeared to be consistent with mill tailings. Sample results indicated elevated levels of lead and arsenic and removal activities were completed on the driveway. Samples were also collected from the driveway after excavation was completed as described in Section 4.1.1.

4.2 ANALYTICAL PARAMETERS

Soil samples were analyzed by START2 using a Spectrace 9000® Field Portable XRF. XRF sample preparation followed the general guidelines set forth below and in Standard Operating Procedure (SOP) 6 from the EPA Bioavailability Study (EPA 1994b). Sample preparation is also described in detail in the site specific removal assessment Sampling and Analysis Plan (SAP) (UOS 2002c). In general soil samples were homogenized, dried, sieved using a 10-mesh sieve, and placed in an appropriate container for analysis.

The XRF was operated as per Environmental Response Team (ERT) SOP 1713 and manufacturers specifications. Quality control for the instrument is discussed in Section 5.2 of this report. Samples were analyzed on the XRF using analysis times of 180 seconds for the source Cd-109, 30 seconds for the source Fe-55, and 30 seconds for the source Am-241.

A minimum of 10 percent of the total number of samples collected for field XRF analysis were also sent to a commercial laboratory for TAL metals analysis (SW846 Method 6010B/7471) as confirmation of field XRF results.

A total of six soil samples were selected and sent to an independent laboratory for TCLP analysis (SW846 Methods 1311/6010B/7471). The samples sent for TCLP analysis represented the samples with the highest concentrations of metals. The acceptable holding times for these samples are 28 days for mercury and six months for all other metals. The definitive data were validated using the Quality Assurance/Quality Control (QA/QC) procedures associated with definitive data. Information

pertaining to screening level and definitive data can be found in the Emergency Response Program (ERP) Generic Quality Assurance Project Plan (QAPP) (UOS 1999).

4.3 AIR MONITORING

Air monitoring was completed during removal activities at the high school track (Photo 5) and the county fairgrounds. These locations were chosen because they were the first properties where removal activities were completed and because they were close to the high school and elementary schools. Specifically, the Data Ram operated for 11 hours on August 24, 2002, during excavation of the high school track while the excavation was being completed on the area closest to the elementary school. During this time the Data RAM was positioned on the elementary school lawn close to the track and downwind of the track. It should be noted that excavation of the material at the high school track was completed before the school season started. In addition football practice was relocated to a nearby park until excavation was completed at the track to minimize exposure of elevated metals to residents of Superior. The Data RAM also operated for 6 hours during the entire excavation of contaminated material from the county fairgrounds. The Data RAM was placed inside the fairground fence line, but closest to the high school to document concentrations of dust near the school. During air monitoring, the Data RAM recorded the amount of PM-10 particulate downwind of the excavation activities (Table 5). Monitoring showed that the levels of dust created from the removal activities was minimal and did not create a health risk to residents in the area.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

5.1 LABORATORY QUALITY CONTROL

Specific QC criteria have been developed to ensure that the Data Quality Objectives (DQOs) established in the SAP can be achieved. Analytical methods for sample analysis have been selected on the basis of the required detection limits, known contaminants existing in the study area, and the range of analytes to be determined. XRF data will be evaluated as screening. Laboratory data will be evaluated as definitive. The Draft ERP Generic QAPP, Section 10.2 "Laboratory Quality Control," contains more specific information related to laboratory QC requirements for definitive data (UOS 1999).

5.2 FIELD QUALITY CONTROL

5.2.1 XRF Analysis

XRF field analytical data were evaluated as screening data, with an additional ten percent of these samples being analyzed by an independent laboratory for definitive confirmation analysis. All XRF data generated for this project were evaluated for instrument calibration, detection limits, energy calibration checks, blank checks, and field replicates. The field XRF was operated per ERT SOP 1713 and per manufacturer's specifications (Environmental Response Team (ERT) 1995).

High lead concentrations may mask arsenic concentrations when analyzed on an XRF. The arsenic detection limit for the XRF is either three times the standard deviation of the XRF standard, or one-tenth the lead result, whichever is greater.

5.2.2 Field Quality Control Samples

In addition to the samples collected to determine elevated concentrations of metals, samples were also collected and analyzed as part of the quality control process.

- A duplicate XRF sample was prepared in the lab for every 20 soil samples.
- A minimum of 1 per 10 soil samples collected for XRF analysis was analyzed by an independent laboratory for confirmation of XRF analytical results. The XRF sample cup was sent to the laboratory for analysis.
- Sand rinsate blanks were collected a minimum of one per day to identify potential contamination from the sample collection and preparation implements.

6.0 ANALYTICAL DATA EVALUATION

All soil samples were analyzed with an XRF during field activities. The XRF field analytical data were evaluated as screening data according to the START ERP Generic QAPP with an additional ten percent of these samples being analyzed by an independent laboratory (CompuChem) for definitive confirmation analyses. All XRF data generated for this project were evaluated to ensure that instrument calibration, detection limits, energy calibration checks, blank checks, and field replicates were within operational control limits. The XRF was operated as per ERT SOP 1713, and per manufacturer's specifications.

Detection limits were calculated both for the XRF instrument used and for all laboratory confirmation samples. Detection limits were established as a value three times the standard deviation of a low National Institute of Standards and Technology (NIST) certified standard run a minimum of seven times over a specified period of time. In the case of arsenic, the detection limit is as stated above or one-tenth of the lead concentration for that sample, whichever is greater.

Validation of the confirmation laboratory data was completed by TechLaw, Inc. of Lakewood, Colorado. All data are acceptable for use as qualified in the data validation reports (Appendix B). The laboratory forms containing the laboratory results are also in Appendix B. Qualifiers used by laboratory validators consisted of U and J. A qualifier of U signifies that the metal was not detected at or above the associated numerical value for that sample. A qualifier of J signifies that the associated numerical value was estimated based on one of many reasons pertaining to laboratory quality assurance. While the value associated with the J qualifier is an estimate, the presence of the metal is reliable. Please refer to the data validation packages for specific criteria for all laboratory confirmation data.

The laboratory data and the XRF metal concentration data were compared using relative percent difference (RPD). Relative percent difference is the difference between the lab and XRF data divided by the average of the two values. This method shows less variability for the larger concentration data because the average (divisor) is higher and the result shows a lower RPD. At lower concentrations, a small variation between the values shows a larger RPD because the average is lower. This method for XRF data evaluation is more specific to whatever range of data is of most interest (usually the "action level"). RPD calculations for arsenic, antimony, lead, and zinc are reported in Table 2. The RPD was not calculated for those results that were qualified as U or J. An RPD value of 35 percent or less suggests an acceptable concentration variance.

Only one sample had an RPD calculated for the lead and arsenic concentrations above 35 percent. Sample S0STKPLB had RPDs of 52% and 44%, respectively (Table 3).

7.0 SAMPLE RESULTS

A total of 44 samples were collected during the removal activities conducted in Superior, Montana. This included 3 sand rinsate samples and 3 duplicate sample aliquots analyzed according to field QA/QC specifications.

Two samples were collected from the staging area located at the Mineral County Airport. These samples were used to document metals concentrations at the airport before it was disturbed. The initial samples collected indicated that the staging area did not have any elevated concentrations of metals present. Both samples showed concentrations of lead and arsenic below 28 ppm and 34 ppm, respectively (Table 2).

Five soil samples were collected from three perspective clean fill source with a total of five types of materials to be used as fill. In addition, samples were also collected by Environmental Response (ER) from one of the fill material sources and sent to an independent laboratory for metals analysis. These sample results indicated that all perspective fill material had acceptable metals concentrations.

Five soil samples were collected from residential areas that had not previously been sampled to assess the concentrations of metals in the respective areas. These samples were collected from three locations and indicated that only one location had metals concentrations above the EPA site specific action levels. The driveway at 401 Spruce Street had 12,000 ppm lead and 2,800 ppm arsenic in the composite sample. This location was added to the original list of properties to have removal activities completed on a portion of the property. Samples were also collected from this property after removal activities as described in the following paragraph.

A total of 19 soil samples were collected from locations after removal activities had been completed. The samples were collected from the base of the excavation to document metals concentrations where excavation had been completed. These samples are listed in Table 1 as post excavation samples and are compared to the original sample results (assessment samples) from the material that was later excavated. All samples collected at the base of excavation had metals concentrations below the site specific action levels set for surficial soil. The highest concentrations of lead and arsenic in post excavation samples occurred at the high

school track and the fairgrounds. One sample from the high school track had 220 ppm arsenic and one sample from the fairgrounds had 1,300 ppm lead. Both samples were collected from the base of excavation (12 to 18 inches below ground surface (bgs)) and were covered with 12 to 18 inches of fill after the sample was collected.

8.0 SUMMARY

Removal activities for the Superior Waste Rock site were completed between August 19 and August 30, 2002. Removal activities were completed at three residential properties, the high school track, the county fairgrounds, and three city owned right-of-ways. A total of 44 samples were collected during the removal activities. Specifically, 3 sand rinsate samples and 3 duplicate sample aliquots were analyzed according to field QA/QC specification. Two samples were collected from the staging area located at the Mineral County airport to document initial concentrations at the airport. Five soil samples were collected from perspective clean fill and five soil samples were collected from residential areas that had not previously been sampled to assess the concentrations of metals in the respective areas. A total of 19 soil samples were collected from locations after removal activities had been completed to document metals concentrations at the base of each excavation.

Soil samples were analyzed on site with an XRF for metals. A minimum of 10 percent of the total number of samples collected for XRF analysis (seven samples) were sent to a commercial laboratory for TAL metals analysis as confirmation of field XRF results. Six soil samples were also sent to a commercial laboratory for TCLP analysis of TAL metals. These samples characterized the waste pile material located at the staging area and also documented the effectiveness of different amounts of cement added to the material to stabilize the leachability of metals.

Air monitoring was completed on two separate occasions to ensure that respirable particulates were not exceeding standards and increasing health risks due to the excavation of material with elevated metals. Air monitoring was completed for 11 hours during removal of contaminated material from the high school track. Air monitoring was also completed for 6 hours during removal activities at the county fairgrounds. Both times a Data RAM with a PM-10 extension was placed downwind of the excavation and at the point closest to the elementary and high school. Air monitoring indicated that dust suppression methods were working properly.

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6TH AVENUE EAST



Removal Summary Report

TDD No. 0208-0002

Superior Waste Rock (ROS)
Superior, Montana

Superior Removal Locations

Figure 1

December 2002

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Oversize Map

TABLE 1
Comparison of Assessment Samples to Post Excavation Samples
Concentrations in ppm

Sample ID	Sample Type	Depth (inches bgs)	Date	Arsenic	Lead
106 3rd AVENUE WEST - RESIDENTIAL DRIVEWAY					
S01063W1S3	Assessment	0-3	June 2002	400 U	4,000
S01063W1D1	Assessment	9-12	June 2002	34 U	29 J
S01063W1Z1	Post Excavation	10	Sept 2002	37 U	120
400 2nd AVENUE WEST - SOUTH RIGHT-OF-WAY					
S04002WSD1	Assessment	0-3	June 2002	100 J	770
S04002W1S3	Assessment	0-3	June 2002	1,200	8,000
S04002W1D3	Assessment	9-12	June 2002	34 U	110
S04002W1Z1	Post Excavation	12	Sept 2002	28 U	55
HIGH SCHOOL TRACK					
IM-SO-08	Assessment	0-3	Oct 2001	101	562
IM-SO-20	Assessment	12-24	Oct 2001	79.4	423
IM-SO-15	Assessment	0-3	Oct 2001	1,340	5,150
S0400HT4D2	Assessment	9-12	June 2002	630	4,400
IM-SO-16	Assessment	0-3	Oct 2001	1,690	4,950
IM-SO-21	Assessment	12-24	Oct 2001	464	1,890
IM-SO-17	Assessment	0-3	Oct 2001	438	1,910
SO400HT4D3	Assessment	9-12	June 2002	370	1,100
IM-SO-18	Assessment	0-3	Oct 2001	279	1,550
IM-SO-22	Assessment	12-24	Oct 2001	1,360	8,500
IM-SO-19	Assessment	0-3	Oct 2001	1,200	6,820
SO400HT4D1	Assessment	9-12	June 2002	190 U	1,900
SO400HT4S1	Assessment	0-3	Sept 2002	1,700	9,000
SO400HT1S2	Assessment	0-3	Sept 2002	1,200	6,800
S0400HT4Z01	Post Excavation	12-18	Sept 2002	220	420
S0400HT4Z02	Post Excavation	12-18	Sept 2002	47 U	110
S0400HT4Z03	Post Excavation	12-18	Sept 2002	55 J	86
S0400HT4Z04	Post Excavation	12-18	Sept 2002	35 U	110
S0400HT4Z05	Post Excavation	12-18	Sept 2002	73 J	280

TABLE 1
Comparison of Assessment Samples to Post Excavation Samples
Concentrations in ppm
(continued)

Sample ID	Sample Type	Depth (inches bgs)	Date	Arsenic	Lead
S0400HT4Z06	Post Excavation	12-18	Sept 2002	47 U	290
S0400HT4Z07	Post Excavation	12-18	Sept 2002	47 U	87
S0400HT4Z08	Post Excavation	12-18	Sept 2002	47 U	21 U
S0400HT4Z09	Post Excavation	12-18	Sept 2002	47 U	26 J
S0400HT4Z10	Post Excavation	12-18	Sept 2002	47 U	31 J
S0400HT4Z11	Post Excavation	12-18	Sept 2002	47 U	160
S0400HT4Z12	Post Excavation	12-18	Sept 2002	47 U	120
400 SPRUCE STREET - EAST RIGHT-OF-WAY					
S0400SPEC1	Assessment	0-3	June 2002	400	1,800
S0400SPED1	Assessment	0-3	June 2002	68 J	300
S0400SPEE1	Assessment	0-3	June 2002	67 U	670
S0400SPEF1	Assessment	0-3	June 2002	170	270
S0400SPEG1	Assessment	0-3	June 2002	150	1,300
S0400SPEDX	Assessment	9-12	June 2002	34 U	23 U
S0400SPEZ1	Post Excavation	12	Sept 2002	37 U	57
407 IRON MOUNTAIN HEIGHTS - RESIDENTIAL DRIVEWAY					
S0407IH1S1	Assessment	0-3	June 2002	170 U	1,700
S0407IH1D1	Assessment	9-12	June 2002	110 J	820
S0407IH1A1	Assessment	12	Sept 2002	36 J	120
S0407IH1Z1	Post Excavation	8	Sept 2002	45 J	230
401 SPRUCE STREET - RESIDENTIAL DRIVEWAY					
S0401SP1S1	Assessment	0-3	Sept 2002	2,800	12,000
S0401SP1Z1	Post Excavation	12	Sept 2002	110 J	560
FAIRGROUNDS					
S700FGCSW1	Assessment	0-3	June 2002	1,500	7,700
S700FGSWX	Assessment	9-12	June 2002	790	4,000
S700FG1A13	Assessment	0-3	Sept 2002	200	850
S700FG1A3	Assessment	0-3	Sept 2002	930	3,300
S700FG1A6	Assessment	0-3	Sept 2002	2,400	7,500

TABLE 1
Comparison of Assessment Samples to Post Excavation Samples
Concentrations in ppm
(continued)

Sample ID	Sample Type	Depth (inches bgs)	Date	Arsenic	Lead
S700FG1Z1	Post Excavation	8	Sept 2002	51 J	240
S700FG1Z2	Post Excavation	12	Sept 2002	130	1,300
400 3rd AVENUE EAST - SOUTH RIGHT-OF-WAY					
S04003ESD1	Assessment	0-3	June 2002	38 U	24 U
S04003ESE1	Assessment	0-3	June 2002	220 U	2,200
S04003ESF1	Assessment	0-3	June 2002	43 J	230
S04003ESG1	Assessment	0-3	June 2002	38 U	100
S04003ESDX	Assessment	9-12	June 2002	34 U	23 U
S04003ESZ1	Post Excavation	12	Sept 2002	28 U	34 J

U The analyte was not detected above the associated value.
 J The associated numerical value is an estimated quantity because quality control criteria were not met
 bgs Below ground surface

TABLE 2
XRF Sample Results
Concentrations in (ppm)

Sample ID	Type	Arsenic	Lead
S0041FC1S1	Assessment	37 U	88
S0041FC1S2	Assessment	37 U	14 J
S00FCCM1S2	Assessment	37 U	150
S00FCCM2S1	Assessment	320 U	3200
S01063W1Z1	Post excavation	37 U	120
S04002W1Z1	Post excavation	28 U	55
S04002W1Z1B	QA/QC	28 U	15 U
S04002W1Z1D	QA/QC	47 J	81
S04003E1Z1	Post excavation	28 U	34 J
S0400HT1S2	Assessment	1,200	6,800
S0400HT4Z01	Post excavation	220	420
S0400HT4Z02	Post excavation	47 U	110
S0400HT4Z03	Post excavation	55 J	86
S400HT4Z04	Post excavation	35 U	110
S0400HT4Z05	Post excavation	73 J	280
S0400HT4Z06	Post excavation	47 U	290
S0400HT4Z07	Post excavation	47 U	87
S0400HT4Z08	Post excavation	47 U	21 U
S0400HT4Z09	Post excavation	47 U	26 J
S0400HT4Z10	Post excavation	47 U	31 J
S0400HT4Z11	Post excavation	47 U	160
S0400HT4Z12	Post excavation	47 U	120
S0400SP1Z1	Post excavation	37 U	57
S0401SP1S1	Assessment	2,800	12,000
S0401SP1S1B	QA/QC	37 U	14 U

TABLE 2
XRF Sample Results
Concentrations in (ppm)
(continued)

Sample ID	Type	Arsenic	Lead
S0401SP1Z1	Post excavation	110 J	560
S0407IH1A1	Assessment	36 J	120
S0407IH1Z1	Post excavation	45 J	230
S0407IH1Z1B	QA/QC	28 U	21 U
S0700FG1A13	Assessment	200	850
S0700FG1A3	Assessment	930	3,300
S0700FG1A6	Assessment	2,400	7,500
S0700FG1Z1	Post excavation	51 J	240
S0700FG1Z2	Post excavation	130	1,300
S0FILLA1	Fill Material	34 U	28 U
S0FILLA2	Fill Material	34 U	28 U
S0FILLB1	Fill Material	58 J	21 U
S0FILLB2	Fill Material	28 U	21 U
S0FILLB2D	QA/QC	28 U	21 U
S0FILLC1	Fill Material	28 U	21 U
S0STGARA1	Staging Area	34 U	28 U
S0STGARA1D	QA/QC	34 U	28 U
S0STGARA2	Staging Area	34 U	28 U
S0STKPLA1	Stockpile A	890	4,800
S0STKPLB1	Stockpile B	130	400

U The analyte was not detected above the associated value.
 J The associated numerical value is an estimated quantity because quality control criteria were not met

TABLE 3
Laboratory and XRF Results (ppm)

Sample ID	Arsenic			Antimony			Lead			Zinc		
	Lab	XRF	RPD	Lab	XRF	RPD	Lab	XRF	RPD	Lab	XRF	RPD
S0STKPLB1	138 J	88 J	44	40.8 J	901	182	682	400	52	948 J	1,100	15
S0STKPLA1	999 J	910	9	558 J	1858	108	5,700	4,800	17	5,370 J	2,900	60
S700FG1Z1	50.6 J	51 J	1	15.9 J	56 U	NA	276	240	14	955 J	1,100	14
S0401SP1S1	3,050 J	2,800	9	2,560 J	2,700	5	15,100	12,000	23	11,600 J	6,000	64
S0400HT4Z09	8.1 J	47 U	NA	3.4 J	39 U	NA	25.1	26 J	4	31.2 J	84 J	92
S01063W1Z1	28.9 J	37 U	NA	13.6 J	46 U	NA	168	120	33	246 J	270	9
S0041FC1S1	4.6 J	37 U	NA	1.2 J	46 U	NA	65.8	88	29	194 J	320	49

U The analyte was not detected above the associated value.
 J The associated numerical value is an estimated quantity because quality control criteria were not met
 [] The associated numerical value was detected below the CRDL, but greater than the method detection limit and is therefore an estimate. Presence of compound is reliable
 RPD Relative Percent Difference (%)
 NA Not applicable.

TABLE 4
TCLP Results (mg/L)

Sample	As	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Regulatory	5	1,000	1	5	5	0.2	1	5
Stockpile A	0.028	0.85	0.29	0.006 U	17.5	0.0002 U	0.01 U	0.005 U
7% to Stockpile A	0.47	0.63	0.002 U	0.066	0.005	0.0002 U	0.01 U	0.005 U
10% to Stockpile A	0.027	1	0.002 U	0.087	0.04	0.0002 U	0.01 U	0.005 U
15% to Stockpile A	0.01 U	1.3	0.002 U	0.087	0.11	0.0002 U	0.01 U	0.005 U
20% to Stockpile A	0.01 U	1.5	0.002 U	0.071	0.18	0.0002 U	0.01 U	0.005 U
Stockpile B	0.01 U	1.4	0.13	0.006 U	0.77	0.0002 U	0.01 U	0.005 U

U The analyte was not detected above the associated value.

TABLE 5
Air Monitoring Summary

Monitoring Date	8/24/02	8/27/02
Excavation Location	High School Track	Fairgrounds
Data RAM Location	Elementary School Lawn	NW corner of Fairgrounds, inside chain link fence
Start Time	7:26:43	7:36:59
Run Time	665 minutes	360 minutes
Avg Mass	3.3 $\mu\text{g}/\text{m}^3$	7.7 $\mu\text{g}/\text{m}^3$
Max Mass	51 $\mu\text{g}/\text{m}^3$	19 $\mu\text{g}/\text{m}^3$
Reason for Maximum Reading	Mowing Lawn in vicinity of Data RAM	Truck driving on High School Track

$\mu\text{g}/\text{m}^3$ Micrograms per cubic meter

APPENDIX A

Photolog

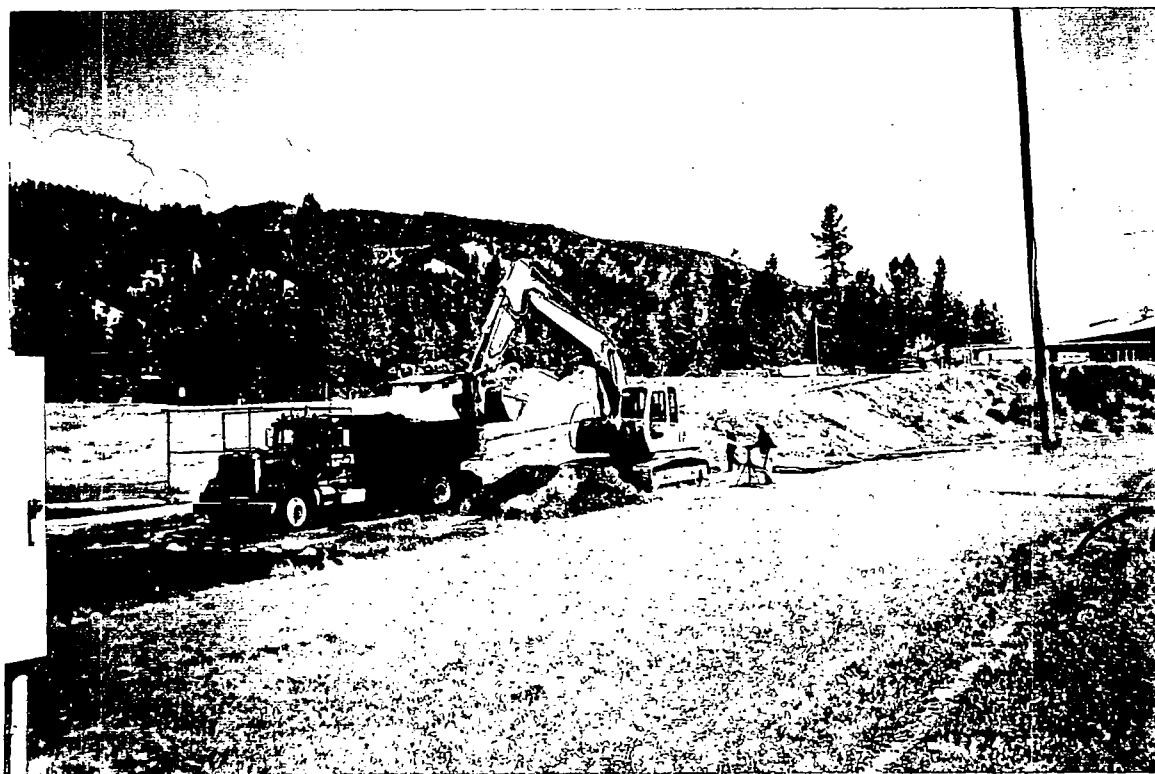


PHOTO 1

Removal activities at the high school track.



PHOTO 2

Edge of the removal area at the high school track.



PHOTO 3

Removal activities at the county fairgrounds.



PHOTO 4

Removal activities at the right-of-way for the 400 block of 2nd Avenue West.

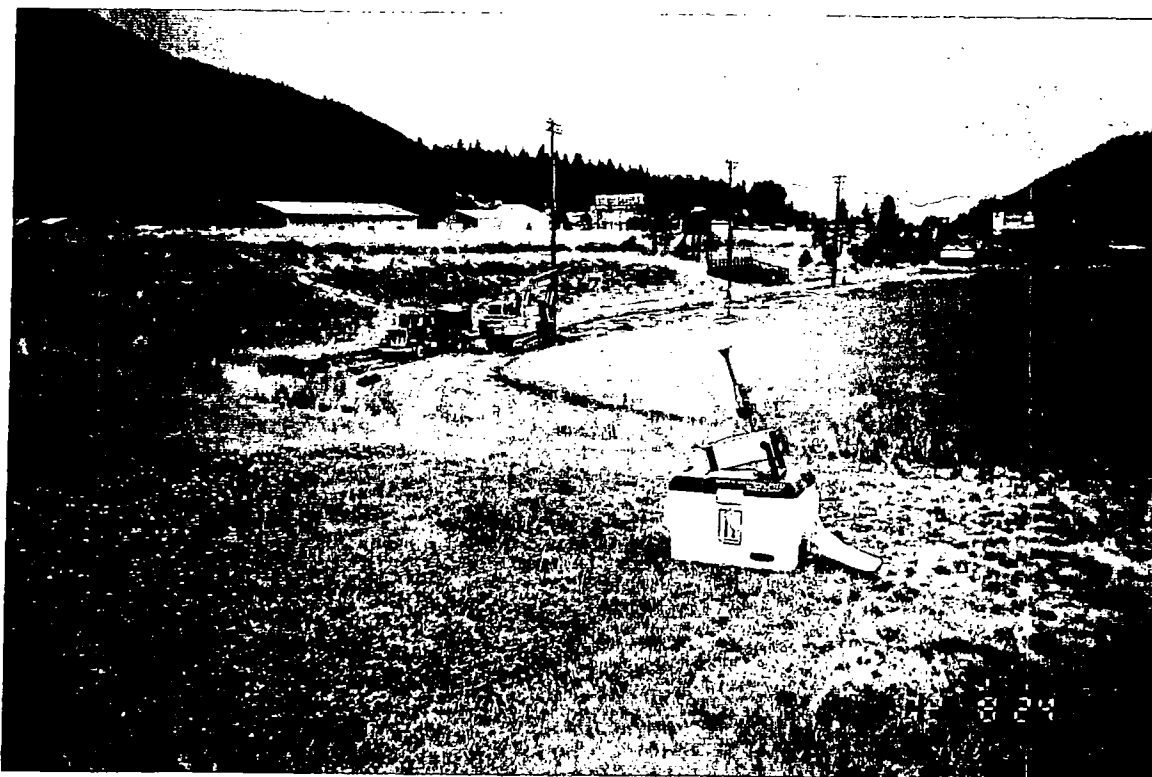


PHOTO 5

Data RAM placed on the elementary school lawn to monitor dust from the high school track removal activities.



PHOTO 6

High school track with clean fill.

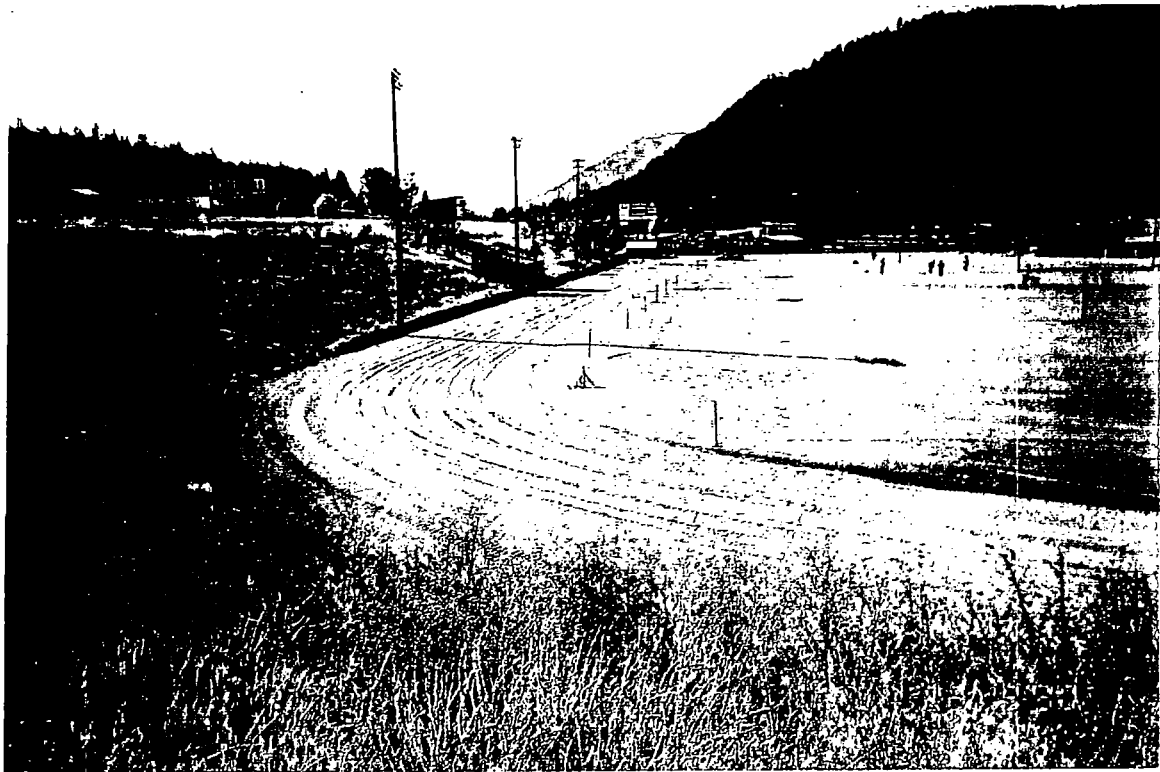


PHOTO 7
High school track with clean fill.



PHOTO 8
View of driveway at 407 Iron Mountain Heights after removal activities are complete. Lighter material is clean fill.



Photo 9

View of right-of-way at the block of 400 Spruce after removal activities are complete.



Photo 10

View of the driveway at 401 Spruce Street after removal activities are complete.



Photo 11

View of the right-of-way at the 400 block of 3rd Avenue East after removal activities are complete.



Photo 12

View of the right-of-way at the 400 block of 3rd Avenue West after the removal activities were completed.



Photo 13

View of the driveway at 106 3rd Avenue West after the removal activities were completed.



Photo 14

Stockpile A located at the staging area after all removal activities were completed.

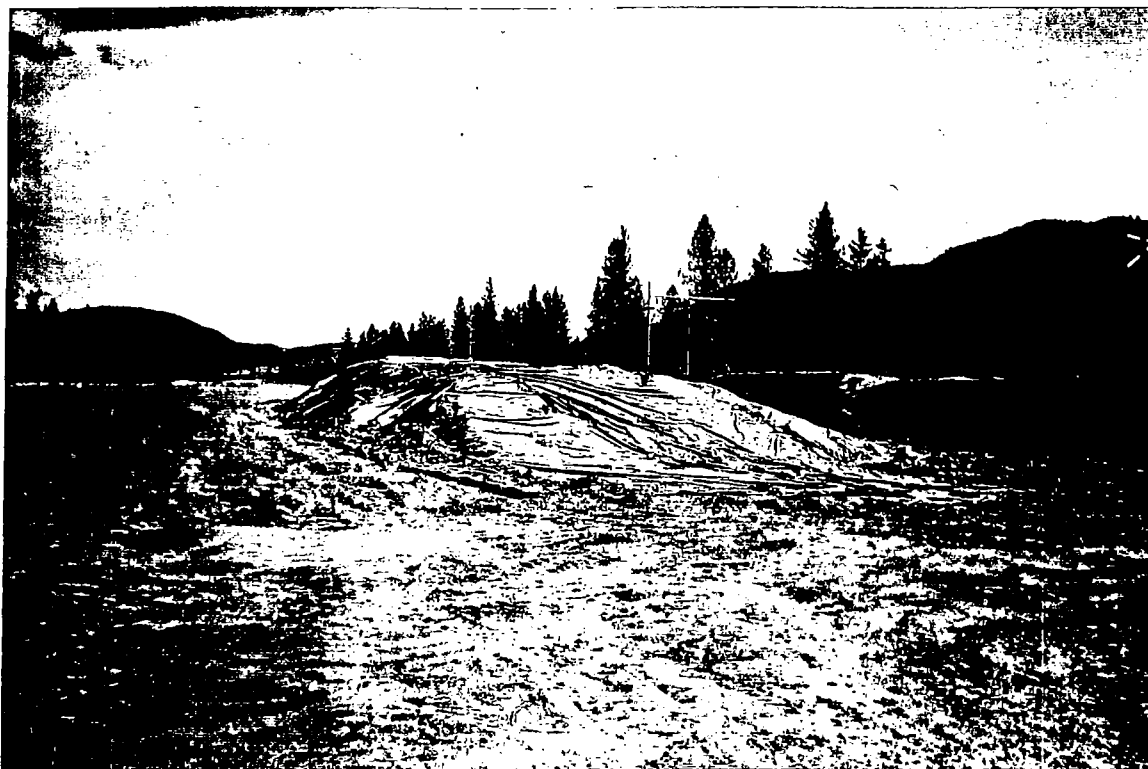
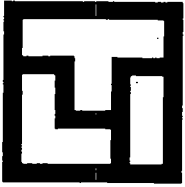


Photo 15

Stockpile B located at the staging area after all removal activities were completes.

APPENDIX B

Validation Reports and Laboratory Data



560 GOLDEN RIDGE ROAD, SUITE 130, GOLDEN, CO 80401

TECHLAW INC.

PHONE: (303) 763-7188
FAX: (303) 763-4896

October 16, 2002

Mr. Kent Alexander
URS Operating Services
1099 18th Street, Suite 710
Denver, CO 80202

**RE: Transmittal of Data Validation Reports
Superior Waste Rock
TDD No. 0208-0002
Report Nos. 103307**

Dear Mr. Alexander:

Please find enclosed one validation report for TDD No. 0208-0002 for the Superior Waste Rock project. This reports is for the validation of metals analyses.

If you have any questions regarding the enclosed reports, please contact me at (303) 763-7188.

Yours sincerely,
TECHLAW, INC.

Bill Fear
Staff Consultant

enclosure
IF: 01027-081

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REGION VIII DATA VALIDATION REPORT INORGANIC

TDD No.	Site Name		Operable Unit
0208-0002	Superior Waste Rock		
RPM/OSC Name			
Tien Nguyen			
Contractor Laboratory	Contract No.	Job No.	Laboratory DPO/Region
SVL Analytical Inc.	Not Indicated	103307	

Review Assigned Date October 7, 2002 Data Validator Amy Ballow
 Review Completion Date October 9, 2002 Report Reviewer Bill Fear

Sample Number	Laboratory ID	Matrix	Analysis
S0STKPLB1	S311633	Soil	Metals and Mercury
S0STKPLA1	S311634		
S0700FG1Z1	S311635		
S0401SP1S1	S311636		
S0400HT4209	S311637		
S01063W121	S311638		
S0041FC1S1	S311639		

DATA QUALITY STATEMENT

- () Data are ACCEPTABLE according to EPA Functional guidelines with no qualifiers (flags) added by the reviewer.
- () Data are UNACCEPTABLE according to EPA Functional Guidelines.
- (X) Data are acceptable with QUALIFICATIONS noted in review.

Telephone/Communication Logs Enclosed? Yes _____ No X

TPO Attention Required? Yes X No _____ If yes, list the items that require attention:

- These samples were collected on August 25 and 28, 2002 but were not received by the laboratory until September 23, 2002. As a result, mercury was analyzed beyond the 28-day holding time.

INORGANIC DATA VALIDATION REPORT

REVIEW NARRATIVE SUMMARY

This data package was reviewed according to "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," February 1994.

Raw data were reviewed for completeness and transcription accuracy onto the summary forms. Approximately 10-20% of the results reported in each of the samples, calibrations, and QC analyses were recalculated and verified. If problems were identified during the recalculation of results, a more thorough calculation check was performed.

Job No. 103307 consisted of seven soil samples for metals and mercury analyses.

The following table lists the data qualifiers added to the sample analyses. Please see Data Qualifier Definitions, attached to the end of this report.

Sample ID	Elements	Qualifiers	Reason for Qualification	Review Section
All samples	Mercury	J	Holding times	II
	Antimony Arsenic		Matrix spike recovery below QC limits	IX
	Zinc		Laboratory duplicate RPD >35%	XI
S0STKPLB1 S0700FG1Z1 S0400HT4209 S0041FC1S1	Selenium	UJ	Analytical spike recovery below QC limits	XII
S0STKPLA1 S0401SP1S1 S0400HT4209 S01063W121 S0041FC1S1	Thallium			
All samples	Copper	J	Serial dilution %D greater than 10% and original sample value at least 50*IDL	XV

Method/SOW Number 6010B, 7740, 7841, 7471

Revision 0.0

Inorganic Deliverables Completeness Checklist

<u>P</u>	Inorganic Cover Page		
<u>P</u>	Inorganic Analysis Data Sheets		
<u>P</u>	Initial Calibration and Calibration Verification Results		
<u>P</u>	Continuing Calibration Verification Results		
<u>P</u>	CRDL Standard for ICP and AA		
<u>P</u>	Blank Analysis Results		
<u>P</u>	ICP Interference Check Sample Results		
<u>P</u>	Spiked Sample Results		
<u>P</u>	Post-digest Spiked Sample Analysis		
<u>P</u>	Duplicate Sample Results		
<u>P</u>	Instrument Detection Limits		
<u>P</u>	Laboratory Control Sample results		
<u>NA</u>	Standard Addition Results		
<u>P</u>	ICP Serial Dilution Results		
<u>NA</u>	Holding Times Summary Sheet		
<u>NP</u>	ICP Interelement Correction Factors		
<u>P</u>	ICP Linear Ranges		
<u>P</u>	Raw Data		
<u>P</u>	Samples	<u>P</u>	Calibration Standards
<u>P</u>	Duplicates	<u>P</u>	ICP QC (ICS and Serial Dilution)
<u>P</u>	Furnace AA	<u>P</u>	Mercury Analysis
		<u>P</u>	Blanks
		<u>P</u>	Spikes
		<u>P</u>	LCS
		<u>NA</u>	Cyanide Analysis
<u>NA</u>	Percent Solids Calculations - Solids Only		
<u>P</u>	Sample Prep/Digestion Logs (Form XIII)		
<u>P</u>	Analysis Run Log (Form XIV)		
<u>P</u>	Chain-of-Custody		
<u>P</u>	Sample Description		
<u>P</u>	Case Narrative		
<u>P</u>	Method References		

KEY:

P = Provided in original data package, as required by the SOW
 R = Provided as Resubmission
 NP = Not provided in original data package or as resubmission
 NR = Not required under the SOW
 NA = Not applicable to this data package or analysis

I. DELIVERABLES

All deliverables were present.

Yes___ No X

Comments: A Form 11 was not provided. No action is required.

II. HOLDING TIMES AND PRESERVATION CRITERIA

All holding times and preservation criteria were met.

Yes___ No X

Comments: According to the sample receipt confirmation form, the sample label for S0400HT4209 reads S0400HT429. No other shipping or receiving problems were noted. Chain-of-custody, summary forms, and raw data were evaluated.

The following table lists the analyses outside holding times, number of days outside holding times, and qualifiers added to the data:

Associated Sample	Days Analyzed Outside Method Holding Time	Analyte	Qualifiers
S0STKPLB1, S0700FG1Z1, S0400HT4209	4	Mercury	J/UJ
S0STKPLA1, S0401SP1S1, S01063W121, S0041FC1S1	1		

These samples were collected on August 25 and 28, 2002 but were not received by the laboratory until September 23, 2002.

III. INSTRUMENT CALIBRATIONS: STANDARDS AND BLANKS

Initial instrument calibrations were performed according to method requirements.

Yes X No___

Comments: None.

The instruments were calibrated daily and each time an analysis run was performed.

Yes X No___

Comments: None.

The instruments were calibrated using one blank and the appropriate number of standards.

Yes X No

Comments: The calibration correlation coefficients were greater than 0.995.

IV. FORM 1 - SAMPLE ANALYSIS RESULTS

Sample analyses were entered correctly on Form Is.

Yes X No

Comments: None.

V. FORM 2A - INITIAL AND CONTINUING CALIBRATION VERIFICATION

The initial and continuing calibration verification standards (ICV and CCV, respectively) met method requirements.

Yes X No

Comments: None.

The calibration verification results were within 90-110% recovery for metals, 85-115% for cyanide, and 80-120% for mercury.

Yes X No

Comments: None.

The continuing calibration standards were run at 10% frequency.

Yes X No

Comments: None.

VI. FORM 2B - CRDL STANDARD FOR ICP AND AA

ICP Analysis: Standards (CRI) at two times the CRDL or the IDL (whichever were greater) were analyzed at the beginning and the end of each sample run, or at a minimum of twice per eight hours, whichever was more frequent.

Yes X No

Comments: None.

GFAA Analysis: Standards (CRA) at two times CRDL were analyzed at the beginning of each sample run.

Yes X No NA

Comments: None.

The CRI and/or the CRA were analyzed after the ICV.

Yes X No NA

Comments: None.

VII. FORM 3 - BLANKS

The initial and continuing calibration blanks (ICB and CCB, respectively) met method requirements.

Yes X No

Comments: None.

The continuing calibration blanks were run at 10% frequency.

Yes X No

Comments: None.

A laboratory/preparation blank was run at the frequency of one per twenty samples, or per sample delivery group (whichever is more frequent), and for each matrix analyzed.

Yes X No

Comments: None.

All analyzed blanks were free of contamination.

Yes No X

Comments: The preparation blank reported zinc at 0.576 mg/Kg. No action was taken, as the positive results for zinc in all samples were greater than the blank action level.

VIII. FORM 4 - ICP INTERFERENCE CHECK SAMPLE

The ICP interference check sample (ICS) was run twice per eight hour shift and/or at the beginning and end of each sample set analysis sequence (whichever is more frequent).

Yes X No

Comments: None.

Percent recovery of the analytes in solution ICSAB were within the range of 80-120%.

Yes X No

Comments: None.

Sample results for aluminum, calcium, iron, and magnesium were less than the ICSA values.

Yes No X

Comments: The sample results for iron exceeded the ICSA values in samples S0STKPLA1 and S0401SP1S1. No action was taken, as the sample results were greater than 5 times the ICSA results for the ICSA values greater than the IDL.

IX. FORM 5A - MATRIX SPIKE SAMPLE ANALYSIS

A matrix spike sample was analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: None.

The percent recoveries (%R) were calculated correctly.

$$\% \text{ Recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = spiked sample result
SR = sample result
SA = spike added

Yes X No

Comments: None.

Spike recoveries were within 75-125% (an exception is granted where the sample concentration is four times the spike concentration).

Yes___ No X

Comments: The following table lists the spike recoveries outside control limits, matrix, samples affected, and data qualifiers:

Element	Spike Recovery	Matrix	Samples Affected	Qualifiers
Antimony	57.2%	Soil	All samples	J/UJ
Arsenic	66.6%			

X. FORM 5B - POST DIGEST SPIKE RECOVERY

A post-digest spike was performed for those elements that did not meet the specified criteria (i.e., pre-digestion/pre-distillation spike recovery falls outside of control limits and sample result is less than four times the spike amount added, exception: Ag, Hg).

Yes X No___ NA___

Comments: The post digest spike recovery for antimony and arsenic were within QC limits. Results are not qualified based on post digest spike data.

XI. FORM 6 - DUPLICATE SAMPLE ANALYSIS

Duplicate sample analysis was performed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No___

Comments: None.

The RPDs were calculated correctly.

Yes X No___

Comments: None.

For sample concentrations greater than five times the CRDL, RPDs were within $\pm 20\%$ (limits of $\pm 35\%$ apply for soil/sediments/tailings samples).

Yes___ No X

Comments: The following table lists the RPDs outside control limits, matrix, samples affected, and data qualifiers:

Element	%RPDs	Matrix	Samples Affected	Qualifiers
Zinc	65.2%	Soil	All samples	J/UJ

The duplicate results for lead and mercury were flagged by the laboratory as exceeding the 20% water criteria at 22.6% and 27.2%, respectively. No action was required, as the soil criteria of 35% was met.

For sample concentrations less than five times the CRDL, duplicate analysis results were within the control window of \pm CRDL (two times CRDL for soils).

Yes X No___

Comments: None.

XII. GFAA QC

Duplicate injections were performed on all GFAA samples and the RSD was within $\pm 20\%$.

Yes X No___ NA___

Comments: All selenium and thallium results were non-detected and no action was required

Analytical spikes were performed on all GFAA samples and the percent recovery was 85 - 115%.

Yes___ No X NA___

Comments: The following table lists the analytical spike recoveries outside control limits, samples affected, and data qualifiers:

Element	Samples	%R	Qualifiers
Selenium	S0STKPLB1 S0700FG1Z1 S0400HT4209 S0041FC1S1	73.7% 63.7% 57.8% 45.0%	UJ
Thallium	S0STKPLA1 S0401SP1S1 S0400HT4209 S01063W121 S0041FC1S1	71.4% 27.3% 66.8% 56.6% 65.7%	

MSAs were analyzed when required and the correlation coefficient was > 0.995 .

Yes___ No___ NA X

Comments: None.

XIII. FORM 7 - LABORATORY CONTROL SAMPLE

The laboratory control sample (LCS) was prepared and analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No___

Comments: None.

All results were within control limits.

Yes X No___

Comments: All LCS recoveries were within the QC limits.

XIV. FORM 8 - STANDARD ADDITION RESULTS

Results from graphite furnace standard additions were entered on Form VIII as directed in the SOW.

Yes___ No___ NA X

Comments: None.

XV. FORM 9 - ICP QC

A serial dilution was performed for ICP analysis with every twenty or fewer samples of a similar matrix, or one per sample delivery group, whichever is more frequent.

Yes X No

Comments: None.

The serial dilution was without interference problems as defined by the method.

Yes No X

Comments: The following serial dilution %Ds were greater than 10% and the original sample result was at least 50* the IDLs:

Element	% Difference	Samples Affected	Qualifiers
Copper	40.4	All samples	J - detects

XVI. FORM 10 - QUARTERLY INSTRUMENT DETECTION LIMITS (IDL)

IDLs were provided for all elements on the target analyte list.

Yes X No

Comments: A Form 10 was provided and the IDLs were the same as the CRDL.

XVII. FORM 11 - INTERELEMENT CORRECTION FACTORS FOR ICP

Interelement corrections for ICP were reported.

Yes No X NA

Comments: Interelement correction factors Form 11 was not provided for the ICP metals. No action was taken.

XVIII. FORM 12 - ICP LINEAR RANGES

ICP linear ranges were reported.

Yes X No NA

Comments: A Form 12 was provided, however, the linear ranges were determined more than 3 months prior to sample analysis.

XIX. LINEAR RANGE VERIFICATION ANALYSIS

Linear Range Verification Analysis (LRA) was performed and results were within control limits of 5% of the true value.

Yes___ No___ NA X

Comments: None.

XX. FORM 13 - PREPARATION LOG

Information on the preparation of samples for analysis was reported on Form XIII.

Yes X No___

Comments: None.

XXI. FORM 14 - ANALYSIS RUN LOG

A Form XIV with the required information was filled out for each analysis run in the data package.

Yes X No___

Comments: None.

XXII. Additional Comments or Problems/Resolutions Not Addressed Above

Yes___ No X

Comments: None.

INORGANIC DATA QUALITY ASSURANCE REVIEW**Region VIII****DATA QUALIFIER DEFINITIONS**

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality. Use of additional qualifiers should be carefully considered. Definitions for all qualifiers used should be provided with each report.

GENERAL QUALIFIERS for use with both INORGANIC and ORGANIC DATA

- R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
- J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
- U J - The reported amount is estimated because Quality Control criteria were not met. Element or compound was not detected.
- N J - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
- N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
- U - The material was analyzed for, but was not-detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

ACRONYMS

AA	Atomic Absorption
Ag	Silver
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CRA	CRDL standard required for AA
CRDL	Contract Required Detection Limit
CRI	CRDL standard required for ICP
CV	Cold Vapor
EPA	U.S. Environmental Protection Agency
GFAA	Graphite Furnace Atomic Absorption
Hg	Mercury
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
ICSA	Interference Check Sample (Solution A)
ICSAB	Interference Check Sample (Solution AB)
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
LCS	Laboratory Control Sample
LRA	Linear Range Verification Analysis
MSA	Method of Standard Additions
PDS	Post Digestion Spike
QC	Quality Control
RPD	Relative Percent Difference
RPM	Regional Project Manager
RSD	Percent Relative Standard Deviation
SA	Spike Added
SAS	Special Analytical Services
SDG	Sample Delivery Group
SOW	Statement of Work
SR	Sample Result
SSR	Spiked Sample Result
TPO	Technical Project Officer

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

S311633

Lab Name: SVL_ANALYTICAL_INC. _____ Contract: _____

Lab Code: SILVER Case No.: _____ SAS No.: _____ SDG No.: 103307

Matrix (soil/water): SOIL_

Lab Sample ID: S311633

Level (low/med): LOW_

Date Received: 09/23/02

Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	8500			P	
7440-36-0	Antimony	40.8		N	P	J
7440-38-2	Arsenic	138		N	P	J
7440-39-3	Barium	103			P	
7440-41-7	Beryllium	0.35			P	
7440-43-9	Cadmium	5.0			P	
7440-70-2	Calcium	13700			P	
7440-47-3	Chromium	8.0			P	
7440-48-4	Cobalt	4.8			P	
7440-50-8	Copper	17.2		E	P	J
7439-89-6	Iron	14800			P	
7439-92-1	Lead	682		*	P	
7439-95-4	Magnesium	6660			P	
7439-96-5	Manganese	649			P	
7439-97-6	Mercury	1.3		*	CV	J
7440-02-0	Nickel	7.4			P	
7440-09-7	Potassium	1580			P	
7782-49-2	Selenium	0.10	U	W	F	UJ
7440-22-4	Silver	5.3			P	
7440-23-5	Sodium	77.5			P	
7440-28-0	Thallium	1.0	U		F	
7440-62-2	Vanadium	10.4			P	
7440-66-6	Zinc	948		*	P	J

Color Before: BROWN _____ Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW _____ Clarity After: _____ Artifacts: _____

Comments:

CLIENT ID: SOSTKPLB1

PERCENT SOLIDS NOT APPLICABLE.

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

S311634

Lab Name: SVL_ANALYTICAL_INC. _____ Contract: _____

Lab Code: SILVER Case No.: _____ SAS No.: _____ SDG No.: 103307

Matrix (soil/water): SOIL_ Lab Sample ID: S311634

Level (low/med): LOW_ Date Received: 09/23/02

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	5380			P	
7440-36-0	Antimony	558		N	P	J
7440-38-2	Arsenic	999		N	P	J
7440-39-3	Barium	75.3			P	
7440-41-7	Beryllium	0.20	U		P	
7440-43-9	Cadmium	30.9			P	
7440-70-2	Calcium	4360			P	
7440-47-3	Chromium	4.6			P	
7440-48-4	Cobalt	4.6			P	
7440-50-8	Copper	44.4		E	P	J
7439-89-6	Iron	44100			P	
7439-92-1	Lead	5700		*	P	
7439-95-4	Magnesium	3480			P	
7439-96-5	Manganese	2410			P	
7439-97-6	Mercury	7.4		*	CV	J
7440-02-0	Nickel	4.8			P	
7440-09-7	Potassium	994			P	
7782-49-2	Selenium	1.0	U		F	
7440-22-4	Silver	48.7			P	
7440-23-5	Sodium	68.0			P	
7440-28-0	Thallium	1.0	U	W	F	UJ
7440-62-2	Vanadium	6.6			P	
7440-66-6	Zinc	5370		*	P	J

Color Before: BROWN_ Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW_ Clarity After: _____ Artifacts: _____

Comments:

CLIENT ID: S0STKPLA1

PERCENT SOLIDS NOT APPLICABLE.

AB

10-0802

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

S311635

Lab Name: SVL_ANALYTICAL_INC. Contract: _____

Lab Code: SILVER Case No.: _____ SAS No.: _____ SDG No.: 103307

Matrix (soil/water): SOIL_ Lab Sample ID: S311635

Level (low/med): LOW_ Date Received: 09/23/02

Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7560	-		P	
7440-36-0	Antimony	15.9	-	N	P	J
7440-38-2	Arsenic	50.6	-	N	P	J
7440-39-3	Barium	69.3	-		P	
7440-41-7	Beryllium	0.32	-		P	
7440-43-9	Cadmium	6.6	-		P	
7440-70-2	Calcium	13900	-		P	
7440-47-3	Chromium	7.6	-		P	
7440-48-4	Cobalt	5.2	-		P	
7440-50-8	Copper	16.7	-	E	P	J
7439-89-6	Iron	13800	-		P	
7439-92-1	Lead	276	-	*	P	
7439-95-4	Magnesium	8030	-		P	
7439-96-5	Manganese	491	-		P	
7439-97-6	Mercury	0.52	-	*	CV	J
7440-02-0	Nickel	7.6	-		P	
7440-09-7	Potassium	1880	-		P	
7782-49-2	Selenium	0.10	U	W	F	UJ
7440-22-4	Silver	3.0	-		P	
7440-23-5	Sodium	54.5	-		P	
7440-28-0	Thallium	1.0	U		F	
7440-62-2	Vanadium	10	-		P	
7440-66-6	Zinc	955	-	*	P	J

Color Before: BROWN_ Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW_ Clarity After: _____ Artifacts: _____

Comments:

CLIENT ID: S0700FG1Z1

PERCENT SOLIDS NOT APPLICABLE.

AB

10-08-02

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

S311636

Lab Name: SVL_ANALYTICAL_INC. _____ Contract: _____

Lab Code: SILVER Case No.: _____ SAS No.: _____ SDG No.: 103307

Matrix (soil/water): SOIL_ Lab Sample ID: S311636

Level (low/med): LOW_ Date Received: 09/23/02

% Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	1490			P	
7440-36-0	Antimony	2560		N	P	J
7440-38-2	Arsenic	3050		N	P	J
7440-39-3	Barium	21.8			P	
7440-41-7	Beryllium	0.20	U		P	
7440-43-9	Cadmium	72.4			P	
7440-70-2	Calcium	974			P	
7440-47-3	Chromium	2.8			P	
7440-48-4	Cobalt	2.6			P	
7440-50-8	Copper	91.4		E	P	J
7439-89-6	Iron	95100			P	
7439-92-1	Lead	15100		*	P	
7439-95-4	Magnesium	1040			P	
7439-96-5	Manganese	3140			P	
7439-97-6	Mercury	18.1		*	CV	J
7440-02-0	Nickel	4.0			P	
7440-09-7	Potassium	432			P	
7782-49-2	Selenium	1.0	U		F	
7440-22-4	Silver	160			P	
7440-23-5	Sodium	51.9			P	
7440-28-0	Thallium	1.0	U	E	F	UJ
7440-62-2	Vanadium	1.4			P	
7440-66-6	Zinc	11600		*	P	J

Color Before: BROWN_ Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW_ Clarity After: _____ Artifacts: _____

Comments:

CLIENT ID: S0401SP1S1

PERCENT SOLIDS NOT APPLICABLE.

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

S311637

Lab Name: SVL_ANALYTICAL_INC. Contract:

Lab Code: SILVER Case No.: SAS No.: SDG No.: 103307

Matrix (soil/water): SOIL

Lab Sample ID: S311637

Level (low/med): LOW

Date Received: 09/23/02

Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7510	-		P	
7440-36-0	Antimony	3.4	-	N	P	J
7440-38-2	Arsenic	8.1	-	N	P	J
7440-39-3	Barium	125	-		P	
7440-41-7	Beryllium	0.34	-		P	
7440-43-9	Cadmium	0.31	-		P	
7440-70-2	Calcium	14300	-		P	
7440-47-3	Chromium	7.9	-		P	
7440-48-4	Cobalt	5.0	-		P	
7440-50-8	Copper	14.1	-	E	P	J
7439-89-6	Iron	12100	-		P	
7439-92-1	Lead	25.1	-	*	P	
7439-95-4	Magnesium	7050	-		P	
7439-96-5	Manganese	261	-		P	
7439-97-6	Mercury	0.08	-	*	CV	J
7440-02-0	Nickel	7.2	-		P	
7440-09-7	Potassium	1700	-		P	
7782-49-2	Selenium	0.10	U	W	F	UJ
7440-22-4	Silver	0.58	-		P	
7440-23-5	Sodium	57.1	-		P	
7440-28-0	Thallium	0.10	U	W	F	UJ
7440-62-2	Vanadium	10.3	-		P	
7440-66-6	Zinc	31.2	-	*	P	J

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

CLIENT ID: S0400HT4209

PERCENT SOLIDS NOT APPLICABLE.

FORM I - IN

ILM02.1

AB

10-08-02

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

S311638

Lab Name: SVL_ANALYTICAL_INC. Contract: _____

Lab Code: SILVER Case No.: _____ SAS No.: _____ SDG No.: 103307

Matrix (soil/water): SOIL_ Lab Sample ID: S311638

Level (low/med): LOW_ Date Received: 09/23/02

Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10000			P
7440-36-0	Antimony	13.6		N	P J
7440-38-2	Arsenic	28.9		N	P J
7440-39-3	Barium	100			P
7440-41-7	Beryllium	0.28			P
7440-43-9	Cadmium	1.5			P
7440-70-2	Calcium	21800			P
7440-47-3	Chromium	6.1			P
7440-48-4	Cobalt	5.9			P
7440-50-8	Copper	16.7		E	P J
7439-89-6	Iron	14400			P
7439-92-1	Lead	168		*	P
7439-95-4	Magnesium	3380			P
7439-96-5	Manganese	446			P
7439-97-6	Mercury	0.15		*	CV J
7440-02-0	Nickel	8.2			P
7440-09-7	Potassium	1660			P
7782-49-2	Selenium	1.0	U		F
7440-22-4	Silver	1.3			P
7440-23-5	Sodium	95.9			P
7440-28-0	Thallium	0.10	U	W	F UJ
7440-62-2	Vanadium	13.0			P
7440-66-6	Zinc	246		*	P J

Color Before: BROWN_ Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW_ Clarity After: _____ Artifacts: _____

Comments:

CLIENT ID: S01063W121

PERCENT SOLIDS NOT APPLICABLE.

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

S311639

Lab Name: SVL_ANALYTICAL_INC. Contract:

Lab Code: SILVER Case No.: SAS No.: SDG No.: 103307

Matrix (soil/water): SOIL Lab Sample ID: S311639

Level (low/med): LOW Date Received: 09/23/02

Solids: 100.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12400	-		P
7440-36-0	Antimony	1.2	-	N	P J
7440-38-2	Arsenic	4.6	-	N	P J
7440-39-3	Barium	137	-		P
7440-41-7	Beryllium	0.31	-		P
7440-43-9	Cadmium	0.92	-		P
7440-70-2	Calcium	12400	-		P
7440-47-3	Chromium	9.8	-		P
7440-48-4	Cobalt	5.3	-		P
7440-50-8	Copper	44.6	-	E	P J
7439-89-6	Iron	17200	-		P
7439-92-1	Lead	65.8	-	*	P
7439-95-4	Magnesium	11600	-		P
7439-96-5	Manganese	432	-		P
7439-97-6	Mercury	0.14	-	*	P CV J
7440-02-0	Nickel	8.5	-		P
7440-09-7	Potassium	4580	-		P
7782-49-2	Selenium	0.10	U	W	F UJ
7440-22-4	Silver	0.76	-		P
7440-23-5	Sodium	80.1	-		P
7440-28-0	Thallium	0.10	U	W	F UJ
7440-62-2	Vanadium	10.6	-		P
7440-66-6	Zinc	194	-	*	P J

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

CLIENT ID: S0041FC1S1

PERCENT SOLIDS NOT APPLICABLE.

AB
10-08-02

I. INORGANIC ANALYSIS WORKSHEET – HOLDING TIMES

TECHLAW

BATCH: 103307

List all analytes which do not meet holding time criteria

28 days

Sample ID	Matrix	List Preservative (A, B, C)	Date Collected	*Metals Analysis Date/s	Hg CVAA Analysis Date/s	*CN Analysis Date	Analysis Date/s	No. of Days Past Holding Time	Action
S311633/S051K PLB1	Soil	→ TLP	8-25-02	09-25-02	09-26-02			Hg = 4 Post - J	J
34/S051K PLB1			8-28	9-26-02				Hg = 4 Post - J	J
35/S0900 FG121			8-25					Hg = 4 Post - J	J
36/S0401 SP151			8-26					Hg = 4 Post - J	J
37/S0400 HT 4209			8-25					Hg = 4 Post - J	J
38/S01063 W121			8-28					Hg = 4 Post - J	J
39/S02151			8-28-02					Hg = 4 Post - J	J
All Hg = "J"									
Note: Sample Receipt pg III									
S0400HT4209 → Sample label = S0400HT429									
COMMENTS (TAL) 6010B-ICP = 9/25/02 lg → 100ml 7471-Hg-CV - 9/26/02									
7060 As								0.2g → LCS	
7421 Pb								0.0g → 100ml - AA	
GFAA 7740 Sc									
7041 Ti									

Actions:

1. If holding times are exceeded, all sample results are estimated (J)/(UJ).
2. If holding times are grossly exceeded ($\geq 2 \times$ holding time), detected results are estimated (J), and non-detected results are rejected (R).

Preservatives:

- A. Preserved w/HNO₃ and cooled to 4°C
- B. Cooled to 4°C
- C. No Preservative

Validated by:

Amy Ballow

Date:

10-08-02

Review By:

B. R. F.

Date:

ANALYTE	HOLDING TIME	PRESERVATIVE
		AQUEOUS
Metals	180 days	pH < 2 w/HNO ₃ , 4 Deg. C
Mercury	28 days	pH < 2 w/HNO ₃ , 4 Deg. C
Cyanide	14 days	pH > 12 w/NaOH, 4 Deg. C
		SOIL
		4 Deg. C
		4 Deg. C
		4 Deg. C

Holding Time = Analysis Date - Collection Date

*VERIFY ANALYSIS DATES ON REPORT MATCH RAW DATA.

Inorg98.xls

TECHLAW

List all ICP analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

Actions:

ICV/CCV Actions:

	PERCENT RECOVERY				
	<75%	75-89%	90-110%	111-125%	>125%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).

Inorg98.xls

TECHLAW

List all AA analytes that did not meet the percent recovery criteria for initial calibration verification (ICV) and continuing calibration verification (CCV).

ICV/CCV Actions:Inorg98.xls

TECHLAW

103307

[illegible]

Yes

• No

Yes

No

$$H_9 = 0.9995$$

Yes

No

Yes

No

v

- Inorg98.xls

TECHLAW

BATCH: 103307

[illegible]

Verify

One prep blank per batch

ICB analyzed immediately after ICV

CCB analyzed after each CCV.

Field/equipment/rinsate blanks analyzed? If so, include above if applicable to project.

COMMENTS

Actions:

- 1 If $|Blank| < IDL$, no action is taken.
- 2 If $Blank \geq IDL$, then all sample results $\geq IDL$ and $< 5 * Blank$ are non-detected (U).
- 3 If $Blank \leq -IDL$, all sample results $\geq IDL$ and $< 5 * |Blank|$ are estimated (J).
- 4 If $Blank \leq -IDL$ then all non-detected results are estimated (UJ).

* If blank concentration > CRDL, all detected sample results < 5 *Blanks are rejected (R).

* If blank concentration > CRDL, all detected sample results > 5 *Blanks and < 10* Blank are estimated (J).

IVB. INORGANIC ANALYSIS WORKSHEET – ICP INTERFERENCE CHECK SAMPLE

BATCH: 103307

Note: For the CLP protocol only, report the concentration of any analytes detected in the ICSC solution > |IDL| that should not be present (apply only to samples with elements identified at concentrations above the ICSC on the previous page).

[illegible]

Actions:

If the ICSA value > the positive IDL:

1. For non-detected results, no action is taken.
2. Estimate (J) all detected results $\leq 5 \cdot \text{ICSA}$.

If the ICSA value < -IDL:

1. Estimate (J) detected results $\leq 5^* |ICSA|$.
2. Estimate (UJ) non-detected results.

V. INORGANIC ANALYSIS WORKSHEET – PRE-DIGESTION MATRIX SPIKE

MATRIX:

BATCH:

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

[illegible]

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

PERCENT RECOVERY

< 30% 30-74% **75-125%** > 125%

Detected results

J

J

V

1

Non-detected Results

R

UJ

v

V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

BATCH: 103307

Sample ID	Analyte	Sample Result	Dup. Results	RPD	Difference ³	Action	Samples Affected
		mg/L					
S911633	Pb	668	838	226	>5x CRDL	None	>5x CRDL - Lab use water 20%
MSD	Hg	1.19	0.91	27.2	↓ —	↓	but w/m 35% - Solid
							<u>No Action</u>
	Zn	2021	1027	65.7		(J)	→ All sample - Zn
	IDL = 5.0						

[Note: IDL = CRDL's]

Inorg98.xls

VII. INORGANIC ANALYSIS WORKSHEET -- LABORATORY CONTROL SAMPLES

MATRIX:

BATCH:

List all parameters that do not meet the percent recovery criteria.

[illegible]

Note:

LCS with the same matrix as samples must be prepared for each SDG.

COMMENTS

Actions:

Exception: Antimony and silver have no control limits. An aqueous LCS is not required for CN and mercury.

1. AQUEOUS

Detected results

Non-detected results

<50%

R

R

PERCENT RECOVERY

50-79%

J

UJ

80-120%

V

V

>120%

J

v

2. SOLID LCS

Recoveries stipulated by EMSL

**BELOW
CONTROL
LIMITS**

J

UJ

WITHIN
CONTROL
LIMITS

V

V

**ABOVE
CONTROL
LIMITS**

۱

V

Detected results

Non-detected results

VIII. INORGANIC ANALYSIS WORKSHEET – ANALYTICAL SPIKE ANALYSIS

BATCH: 103307

List all samples whose analytical spike recovery did not meet the 85-115% recovery criteria.

Analyte	Sample ID	Sample Result	Spiked Sample Result	True Spike Value	% R	Action	Comment
Se	5311633	508TKBLB1			73.7	UJ	
	5311634				36.6	see RR	
	635	50900F61Z1			63.7	UJ	
	636				5.9	RR	
	637	50900HT4209			57.8	UJ	
	638				26.2	RR	
	639	50091FC1S1			45.0	UJ	
Se	5311634	10					
	26	10					
Tl	5311633				3.6		
	34				2.8		
	35				37.9		
	36				3.4		
	37	50900HT4209			66.8	UJ	
	38	501063W1Z1			56.6	UJ	
	39	50091FC1S1			65.7	UJ	
	633	10			-		
	639	10	508TKPLA2		71.4	UJ	
	635	10			-		
	636	10	50401SP1S1		27.3	UJ	
1. Spike Recovery for CLP Protocol: One point analytical spikes were performed for all GFAA samples? Yes No							
2. Spike Recovery for SW-846: One analytical spike was analyzed per batch or matrix, whichever is more frequent? Yes No							
COMMENTS All Se + Tl result = "U"							

If the sample result is <50% of the spike result, or the sample result is >50% of the spike result* and the percent recovery is <40% or between 80-115%, the following apply.

Actions:	PERCENT RECOVERY			
	10%	10-84%	85-115%	>115%
Detected results	J	J	V	J
Non-detected results	R	UJ	V	V

*Spike result = [spiked sample result - sample result]

BATCH: 103307

[illegible]

Serial dilutions were performed for each matrix and results of the diluted sample analysis agreed within ten percent of the original undiluted analysis.	Yes	No
Serial dilutions were not performed for the following:		

COMMENTS

Estimate (J) detected results if %D is > 10%.

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

X. INORGANIC ANALYSIS WORKSHEET – SAMPLE RESULT VERIFICATION

BATCH: 109307

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.)

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument, and were not reanalyzed.

3. Were ICP linear ranges obtained within 3 months of, and preceding, the sample analyses? Yes No NA3/6/02 Analyz 9-25-024. Were ICP interelement corrections obtained within 12 months of, and preceding, the sample analyses? Yes No NANo Form 11's5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? Yes No NA02/06/02 Analyz 9-25-02
01/21/02
226. Were all sample results reported down to the IDL if running CLP protocol? Yes No NA7. Were all sample results reported down to MDL if running SW-846 methods? Yes No NA

8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? Yes No

S311634 = *10 Fe	/	S311634) *10 = Se	/	S311633) =10.7L
S311636 = *10 Fe, Zn		36			34	
		38			38	
					36	

COMMENTS

ICP 1g → 100ml

S311634 = *10 Hg
36 = *20 ↓Hg = 0.6 → 100ml
(except LCS = 0.2g → 100ml)



560 GOLDEN RIDGE ROAD, SUITE 130, GOLDEN, CO 80401

TECHLAW INC.

PHONE: (303) 763-7188
FAX: (303) 763-4896

September 30, 2002

Mr. Kent Alexander
URS Operating Services
1099 18th Street, Suite 710
Denver, CO 80202

**RE: Transmittal of Data Validation Report
Superior Waste Rock
TDD No. 0208-0002
Report No. 102970**

Dear Mr. Alexander:

Please find enclosed one validation report for TDD No. 0208-0002 for the Superior Waste Rock project. This report is for the validation of TCLP metals and mercury analyses.

If you have any questions regarding the enclosed report, please contact me at (303) 763-7188.

Yours sincerely,
TECHLAW, INC.

Lisa Tyson
Staff Consultant

enclosure
IF: 01027-102



**REGION VIII
DATA VALIDATION REPORT
INORGANIC**

TDD No.	Site Name		Operable Unit
0208-0002	Superior Waste Rock		
RPM/OSC Name			
Tien Nguyen			
Contractor Laboratory	Contract No.	Job No.	Laboratory DPO/Region
SVL Analytical Inc.	Not Indicated	102970	

Review Assigned Date September 24, 2002 Data Validator Lisa Tyson
 Review Completion Date September 30, 2002 Report Reviewer Bill Fear

Sample Number	Laboratory ID	Matrix	Analysis
S0STKPLA00	E309034	Leachate	TCLP Metals and Mercury
S0STKPLB00	E309035		
S0STKPLA07	E309036		
S0STKPLA10	E309037		
S0STKPLA15	E309038		
S0STKPLA20	E309039		

DATA QUALITY STATEMENT

- (X) Data are ACCEPTABLE according to EPA Functional guidelines with no qualifiers (flags) added by the reviewer.
- () Data are UNACCEPTABLE according to EPA Functional Guidelines.
- () Data are acceptable with QUALIFICATIONS noted in review.

Telephone/Communication Logs Enclosed? Yes _____ No X

TPO Attention Required? Yes _____ No X If yes, list the items that require attention:

INORGANIC DATA VALIDATION REPORT

REVIEW NARRATIVE SUMMARY

This data package was reviewed according to "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," February 1994.

Raw data were reviewed for completeness and transcription accuracy onto the summary forms. Approximately 10-20% of the results reported in each of the samples, calibrations, and QC analyses were recalculated and verified. If problems were identified during the recalculation of results, a more thorough calculation check was performed.

Job No. 102970 consisted of six samples for TCLP metals and mercury analyses.

The following table lists the data qualifiers added to the sample analyses. Please see Data Qualifier Definitions, attached to the end of this report.

Sample ID	Elements	Qualifiers	Reason for Qualification	Review Section
None	None	None	None	None

Method/SOW Number TCLP
Revision 0.0

Inorganic Deliverables Completeness Checklist

<u>P</u>	Inorganic Cover Page		
<u>P</u>	Inorganic Analysis Data Sheets		
<u>P</u>	Initial Calibration and Calibration Verification Results		
<u>P</u>	Continuing Calibration Verification Results		
<u>P</u>	CRDL Standard for ICP and AA		
<u>P</u>	Blank Analysis Results		
<u>P</u>	ICP Interference Check Sample Results		
<u>P</u>	Spiked Sample Results		
<u>P</u>	Post-digest Spiked Sample Analysis		
<u>P</u>	Duplicate Sample Results		
<u>P</u>	Instrument Detection Limits		
<u>P</u>	Laboratory Control Sample results		
<u>NA</u>	Standard Addition Results		
<u>P</u>	ICP Serial Dilution Results		
<u>NA</u>	Holding Times Summary Sheet		
<u>NP</u>	ICP Inter-element Correction Factors		
<u>P</u>	ICP Linear Ranges		
<u>P</u>	Raw Data		
<u>P</u>	Samples	<u>P</u>	Calibration Standards
<u>P</u>	Duplicates	<u>P</u>	ICP QC (ICS and Serial Dilution)
<u>P</u>	Furnace AA	<u>P</u>	Mercury Analysis
		<u>P</u>	Blanks
		<u>P</u>	Spikes
		<u>P</u>	LCS
		<u>NA</u>	Cyanide Analysis
<u>NA</u>	Percent Solids Calculations - Solids Only		
<u>P</u>	Sample Prep/Digestion Logs (Form XIII)		
<u>P</u>	Analysis Run Log (Form XIV)		
<u>P</u>	Chain-of-Custody		
<u>P</u>	Sample Description		
<u>P</u>	Case Narrative		
<u>P</u>	Method References		

KEY:

P = Provided in original data package, as required by the SOW
R = Provided as Resubmission
NP = Not provided in original data package or as resubmission
NR = Not required under the SOW
NA = Not applicable to this data package or analysis

I. DELIVERABLES

All deliverables were present.

Yes___ No X

Comments: A Form 11 was not provided. No action is required.

II. HOLDING TIMES AND PRESERVATION CRITERIA

All holding times and preservation criteria were met.

Yes X No___

Comments: All samples were analyzed within required holding times. No shipping or receiving problems were noted. Chain-of-custody, summary forms, and raw data were evaluated.

III. INSTRUMENT CALIBRATIONS: STANDARDS AND BLANKS

Initial instrument calibrations were performed according to method requirements.

Yes X No___

Comments: None.

The instruments were calibrated daily and each time an analysis run was performed.

Yes X No___

Comments: None.

The instruments were calibrated using one blank and the appropriate number of standards.

Yes X No___

Comments: The calibration correlation coefficients were greater than 0.995.

IV. FORM 1 - SAMPLE ANALYSIS RESULTS

Sample analyses were entered correctly on Form Is.

Yes X No

Comments: None.

V. FORM 2A - INITIAL AND CONTINUING CALIBRATION VERIFICATION

The initial and continuing calibration verification standards (ICV and CCV, respectively) met method requirements.

Yes X No

Comments: None.

The calibration verification results were within 90-110% recovery for metals, 85-115% for cyanide, and 80-120% for mercury.

Yes X No

Comments: None.

The continuing calibration standards were run at 10% frequency.

Yes X No

Comments: None.

VI. FORM 2B - CRDL STANDARD FOR ICP AND AA

ICP Analysis: Standards (CRI) at two times the CRDL or the IDL (whichever were greater) were analyzed at the beginning and the end of each sample run, or at a minimum of twice per eight hours, whichever was more frequent.

Yes X No

Comments: None.

GFAA Analysis: Standards (CRA) at two times CRDL were analyzed at the beginning of each sample run.

Yes___ No___ NA X

Comments: The laboratory did not perform GFAA analyses.

The CRI and/or the CRA were analyzed after the ICV.

Yes___ No___ NA X

Comments: None.

VII. FORM 3 - BLANKS

The initial and continuing calibration blanks (ICB and CCB, respectively) met method requirements.

Yes X No___

Comments: None.

The continuing calibration blanks were run at 10% frequency.

Yes X No___

Comments: None.

A laboratory/preparation blank was run at the frequency of one per twenty samples, or per sample delivery group (whichever is more frequent), and for each matrix analyzed.

Yes X No___

Comments: None.

All analyzed blanks were free of contamination.

Yes X No___

Comments: None.

VIII. FORM 4 - ICP INTERFERENCE CHECK SAMPLE

The ICP interference check sample (ICS) was run twice per eight hour shift and/or at the beginning and end of each sample set analysis sequence (whichever is more frequent).

Yes X No

Comments: None.

Percent recovery of the analytes in solution ICSAB were within the range of 80-120%.

Yes X No

Comments: None.

Sample results for aluminum, calcium, iron, and magnesium were less than the ICSA values.

Yes X No

Comments: None.

IX. FORM 5A - MATRIX SPIKE SAMPLE ANALYSIS

A matrix spike sample was analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: None.

The percent recoveries (%R) were calculated correctly.

$$\% \text{ Recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = spiked sample result

SR = sample result

SA = spike added

Yes X No

Comments: None.

Spike recoveries were within 75-125% (an exception is granted where the sample concentration is four times the spike concentration).

Yes___ No X

Comments: The spike recoveries for selenium (129.0%) and mercury (151.8%) exceeded the 75-125% criteria. However, no qualification was necessary because detected results for these elements were not reported in the samples.

X. FORM 5B - POST DIGEST SPIKE RECOVERY

A post-digest spike was performed for those elements that did not meet the specified criteria (i.e., pre-digestion/pre-distillation spike recovery falls outside of control limits and sample result is less than four times the spike amount added, exception: Ag, Hg).

Yes X No___ NA___

Comments: The post digest spike recovery for selenium was within QC limits and a post digest spike was not required for mercury. Results are not qualified based on post digest spike data.

XI. FORM 6 - DUPLICATE SAMPLE ANALYSIS

Duplicate sample analysis was performed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No___

Comments: None.

The RPDs were calculated correctly.

Yes X No___

Comments: None.

For sample concentrations greater than five times the CRDL, RPDs were within $\pm 20\%$ (limits of $\pm 35\%$ apply for soil/sediments/tailings samples).

Yes X No___

Comments: None.

For sample concentrations less than five times the CRDL, duplicate analysis results were within the control window of \pm CRDL (two times CRDL for soils).

Yes X No

Comments: None.

XII. GFAA QC

Duplicate injections were performed on all GFAA samples and the RSD was within \pm 20%.

Yes No NA X

Comments: None.

Analytical spikes were performed on all GFAA samples and the percent recovery was 85 - 115%.

Yes No NA X

Comments: None.

MSAs were analyzed when required and the correlation coefficient was > 0.995 .

Yes No NA X

Comments: None.

XIII. FORM 7 - LABORATORY CONTROL SAMPLE

The laboratory control sample (LCS) was prepared and analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: None.

All results were within control limits.

Yes X No

Comments: All LCS recoveries were within the QC limits of 80-120%.

XIV. FORM 8 - STANDARD ADDITION RESULTS

Results from graphite furnace standard additions were entered on Form VIII as directed in the SOW.

Yes___ No___ NA X

Comments: None.

XV. FORM 9 - ICP QC

A serial dilution was performed for ICP analysis with every twenty or fewer samples of a similar matrix, or one per sample delivery group, whichever is more frequent.

Yes X No___

Comments: None.

The serial dilution was without interference problems as defined by the method.

Yes X No___

Comments: All %Ds were less than 10% or the original sample result was less than 50 times the IDL.

XVI. FORM 10 - QUARTERLY INSTRUMENT DETECTION LIMITS (IDL)

IDLs were provided for all elements on the target analyte list.

Yes X No___

Comments: A Form 10 was provided and the IDLs were the same as the CRDL with the exception of chromium.

XVII. FORM 11 - INTERELEMENT CORRECTION FACTORS FOR ICP

Interelement corrections for ICP were reported.

Yes___ No X NA___

Comments: Interelement correction factors Form 11 was not provided for the ICP metals. No action was taken.

XVIII. FORM 12 - ICP LINEAR RANGES

ICP linear ranges were reported.

Yes X No NA

Comments: A Form 12 was provided, however, the linear ranges were determined more than 3 months prior to sample analysis.

XIX. LINEAR RANGE VERIFICATION ANALYSIS

Linear Range Verification Analysis (LRA) was performed and results were within control limits of 5% of the true value.

Yes No NA X

Comments: None.

XX. FORM 13 - PREPARATION LOG

Information on the preparation of samples for analysis was reported on Form XIII.

Yes X No

Comments: None.

XXI. FORM 14 - ANALYSIS RUN LOG

A Form XIV with the required information was filled out for each analysis run in the data package.

Yes X No

Comments: None.

XXII. Additional Comments or Problems/Resolutions Not Addressed Above

Yes X No

Comments: The sample log-in sheet that associates the EPA sample numbers with the assigned laboratory numbers was not consistent with other portions of the data package. The laboratory was contacted and after a review of the data, a revised sample log-in sheet was provided.

3

EPA SAMPLE NO.

E309034

LT 9/30/02

INORGANIC DATA QUALITY ASSURANCE REVIEW**Region VIII****DATA QUALIFIER DEFINITIONS**

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality. Use of additional qualifiers should be carefully considered. Definitions for all qualifiers used should be provided with each report.

GENERAL QUALIFIERS for use with both INORGANIC and ORGANIC DATA

- R** - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
- J** - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
- U J** - The reported amount is estimated because Quality Control criteria were not met. Element or compound was not detected.
- N J** - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
- N** - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
- U** - The material was analyzed for, but was not-detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

ACRONYMS

AA	Atomic Absorption
Ag	Silver
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CRA	CRDL standard required for AA
CRDL	Contract Required Detection Limit
CRI	CRDL standard required for ICP
CV	Cold Vapor
EPA	U.S. Environmental Protection Agency
GFAA	Graphite Furnace Atomic Absorption
Hg	Mercury
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
ICSA	Interference Check Sample (Solution A)
ICSAB	Interference Check Sample (Solution AB)
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
LCS	Laboratory Control Sample
LRA	Linear Range Verification Analysis
MSA	Method of Standard Additions
PDS	Post Digestion Spike
QC	Quality Control
RPD	Relative Percent Difference
RPM	Regional Project Manager
RSD	Percent Relative Standard Deviation
SA	Spike Added
SAS	Special Analytical Services
SDG	Sample Delivery Group
SOW	Statement of Work
SR	Sample Result
SSR	Spiked Sample Result
TPO	Technical Project Officer

TECHLAW

List all analytes which do not meet holding time criteria

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TECHLAW

[illegible]

COMMENTS

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TECHLAW

List all mercury results that did not meet the percent recovery criteria for the ICV and/or CCV standard.

[illegible]

Actions:

	PERCENT RECOVERY				
	<65%	65-79%	80-120%	121-135%	>135%
Detected results	R	J	V	J	R
Non-detected Results	R	UJ	V	V	V

1. If four standards and a blank were not used for initial calibration, or the instrument was not calibrated daily and each time the instrument was set up, qualify the data as rejected (R).
2. If the initial calibration correlation coefficient was less than 0.995, qualify sample results as estimated (J)/(UJ).

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BATCH: 102970

[illegible]

Verify

One prep blank per batch

CCB analyzed after each CCV.

COMMENTS

1. If $|\text{Blank}| < \text{IDL}$, no action is taken.
2. If $\text{Blank} \geq \text{IDL}$, then all sample results $\geq \text{IDL}$ and $< 5 \cdot \text{Blank}$ are non-detected (U).
3. If $\text{Blank} = -\text{IDL}$, all sample results $\geq \text{IDL}$ and $< 5 \cdot |\text{Blank}|$ are estimated (J).
4. If $\text{Blank} = -\text{IDL}$ then all non-detected results are estimated (UJ).

* If blank concentration $> \text{CRDL}$, all detected sample results $< 5 \cdot \text{Blanks}$ are rejected (R).

* If blank concentration $> \text{CRDL}$, all detected sample results $> 5 \cdot \text{Blanks}$ and $< 10 \cdot \text{Blank}$ are estimated (J).

BATCH: 102970

Examine the sample results in ug/L and list any Al, Ca, Fe or Mg results that are greater than the ICSA values.

[illegible][illegible]

Were Interference Check Samples run at the beginning and end of each sample analysis run, or a minimum of twice per 8-hour shift (whichever is more frequent)? Yes No

COMMENTS

Actions:

PERCENT RECOVERY

	<50%	50-79%	80-120%	>120%
Detected results	R	J	V	J
Non-detected results	R	UJ	V	V

V. INORGANIC ANALYSIS WORKSHEET -- PRE-DIGESTION MATRIX SPIKE

MATRIX: Leah

BATCH: 102970

List all parameters that do not meet the percent recovery criteria. Note: The pre-digestion spike recovery criteria are not evaluated for Ca, Mg, K, Na, Al and Fe for soil samples, and Ca, Mg, K and Na for water samples.

If the sample result exceeds the spike added by a factor of 4 or more, no action is taken.

[illegible]

1. Was a pre-digestion matrix spike prepared at the required frequency of once every 20 samples, or every SDG (whichever is more frequent)? ☒ Yes ☐ No

2. Was a post-digestion matrix spike analyzed for all ICP elements, except Silver, that did not meet the pre-digestion matrix spike recovery criteria? (Yes) No NA 5 0 982

3. Was a matrix spike prepared for each different sample matrix?	Yes	No
--	-----	----

COMMENTS

1. If any analyte does not meet the % R criteria, qualify all associated samples using the following criteria:

Actions:

PERCENT RECOVERY

	< 30%	30-74%	75-125%	> 125%
Detected results	J	J	V	J
Non-detected Results	R	UJ	V	V

Note

If analyte concentrations in the sample is greater than 4 times the amount spiked, then limits do not apply.

BATCH: 102970

[illegible]

Serial dilutions were not performed for the following

COMMENTS

If results from diluted samples are higher than concentrated sample, matrix interference should be suspected and sample results may be biased low.

X. INORGANIC ANALYSIS WORKSHEET -- SAMPLE RESULT VERIFICATION

BATCH: 102970

1. Describe any raw data anomalies (i.e., baseline shifts, negative absorbances, transcription or calculation errors, legibility, etc.)

None

2. List results that fall outside the linear range of the ICP instrument or the calibrated range of the AA or Cyanide instrument; and were not reanalyzed.

None3. Were ICP linear ranges obtained ~~within 3 months of~~ and preceding, the sample analyses? ☒ Yes ☐ No ☐ NA4. Were ICP interelement corrections obtained ~~within 12 months of~~ and preceding, the sample analyses? ☒ Yes ☐ No ☐ NA5. Were instrument detection limits present, found to be less than or equal to the CRDL, and obtained within 3 months of, and preceding, the sample analyses? ☐ Yes ☒ No ☐ NA6. Were all sample results reported down to the IDL if running CLP protocol? ☒ Yes ☐ No ☐ NA7. Were all sample results reported down to MDL if running SW-846 methods? ☐ Yes ☒ No ☐ NA8. Were sample weights, volumes, percent solids, and dilutions used correctly when reporting the results? ☐ Yes ☐ No

COMMENTS

CRDL = IDL detected CR to IRAll reported to "CRDL" - no "IDL's" - commentNo Form 11 - comment

TECHLAW

BATCH: 102970

[illegible][illegible]

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APPENDIX C

XRF Results

TABLE 1A
Site Name
SPECTRACE 9000 XRF DATA (PPM)

ID	DATE	TIME	Sb	As	Ba	Cd	Ca	CrHI	CrLO	Co	Cu	Fe	Pb	Mn
S0041FC1S1	8/28/2002	1843	46 U	37 U	410	110 U	15000	540 J	730 U	350 U	70 U	23000	88	350 U
S0041FC1S2	8/28/2002	1838	46 U	37 U	360	110 U	50000	910	730 U	350 U	70 U	19000	14 J	390 J
S00FCCM1S2	8/28/2002	1826	46 U	37 U	450	130 J	28000	670 J	730 U	350 U	70 U	19000	150	350 U
S00FCCM2S1	8/28/2002	1832	390	320 U	350	110 U	16000	520 J	730 U	350 U	70 U	37000	3200	2400
S01063W1Z1	8/28/2002	1810	46 U	37 U	450	110 U	20000	520 J	730 U	350 U	70 U	20000	120	580 J
S04002W1Z1	8/29/2002	1607	52 U	28 U	490	210 U	8100	780 J	380 U	470 U	56 U	17000	55	400 J
S04002W1Z1B	8/29/2002	1627	52 U	28 U	57 U	210 U	1600 U	410 U	380 U	470 U	56 U	1600 U	15 U	210 U
S04002W1Z1D	8/29/2002	1617	52 U	47 J	480	210 U	6900	480 J	440 J	470 U	56 U	16000	81	420 J
S04003E1Z1	8/29/2002	1637	52 U	28 U	520	210 U	7600	570 J	380 U	470 U	56 U	15000	34 J	360 J
S0400HT1S2	8/23/2002	1032	1200	1200	190 J	230 U	4500 J	440 U	570 U	350 U	49 U	43000	6800	2700
S0400HT4Z01	8/23/2002	1138	86 U	220	490	230 U	28000	440 U	570 U	350 U	49 U	18000	420	820 J
S0400HT4Z02	8/25/2002	916	44 J	47 U	430	150 U	22000	490 J	960 U	230 U	54 U	19000	110	440 U
S0400HT4Z03	8/25/2002	905	39 U	55 J	420	150 U	32000	590 J	960 U	380 J	54 U	17000	86	470 J
S0400HT4Z05	8/25/2002	1002	93 J	73 J	360	150 U	20000	440 J	960 U	320 J	54 U	19000	280	710 J
S0400HT4Z06	8/25/2002	922	43 J	47 U	410	150 U	22000	450 J	960 U	230 U	54 U	21000	290	580 J
S0400HT4Z07	8/25/2002	932	39 U	47 U	390	150 U	18000	390 U	960 U	230 U	54 U	13000	87	440 U
S0400HT4Z08	8/25/2002	949	39 U	47 U	440	150 U	17000	400 J	960 U	230 U	54 U	14000	21 U	440 U
S0400HT4Z09	8/25/2002	944	39 U	47 U	440	150 U	19000	390 U	960 U	330 J	54 U	16000	26 J	440 U
S0400HT4Z10	8/25/2002	1007	39 U	47 U	400	150 U	19000	710 J	960 U	250 J	54 U	17000	31 J	440 U
S0400HT4Z11	8/25/2002	1043	39 U	47 U	400	150 U	21000	390 U	960 U	230 U	54 U	19000	160	440 U
S0400HT4Z12	8/25/2002	1022	39 U	47 U	360	150 U	19000	780 J	960 U	290 J	54 U	17000	120	440 U
S0400SP1Z1	8/28/2002	1853	47 J	37 U	460	110 U	8800	620 J	730 U	350 U	70 U	15000	57	500 J
S0401SP1S1	8/28/2002	1759	2700	2800	210 J	310 J	3200 J	410 J	730 U	620 J	70 U	70000	12000	2600
S0401SP1S1B	8/28/2002	1805	46 U	37 U	66 U	110 U	2300 U	310 J	730 U	350 U	70 U	1300 U	14 U	350 U
S0401SP1Z1	8/28/2002	1216	120 J	110 J	460	110 U	7200 J	700 J	730 U	350 U	70 U	17000	560	760 J
S0407IH1A1	8/25/2002	1441	67 J	36 J	370	150 U	7700	630	270 U	260 U	38 U	22000	120	740 U
S0407IH1Z1	8/25/2002	1541	56 U	45 J	440	150 U	19000	600 J	270 U	540 J	38 U	22000	230	980 J
S0407IH1Z1B	8/25/2002	1549	56 U	28 U	90 U	150 U	1800 U	300 J	270 U	260 U	38 U	1900 U	21 U	740 U
S0700FG1A13	8/25/2002	850	110 J	200	390	150 U	27000	390 J	270 U	260 U	38 U	19000	850	940 J
S0700FG1A3	8/25/2002	840	530	930	420	150 U	12000	320 J	270 U	320 J	38 U	40000	3300	3600
S0700FG1A6	8/25/2002	845	1300	2400	250 J	180 J	3200 J	280 J	270 U	350 J	38 U	54000	7500	4800
S0700FG1Z1	8/25/2002	1026	56 U	51 J	430	150 U	18000	550 J	270 U	260 U	38 U	19000	240	740 U
S0700FG1Z2	8/25/2002	1032	240	130	340	150 U	10000	580 J	270 U	260 U	38 U	21000	1300	2000 J
S0FILLA1	8/23/2002	1229	86 U	34 U	520	230 U	7700	480 J	570 U	350 U	49 U	19000	28 U	600 J
S0FILLA2	8/23/2002	1234	86 U	34 U	480	230 U	5300 J	440 J	570 U	350 U	49 U	12000	28 U	480 U

U - The analyte was not detected above the detection limit. The detection limit is reported.

J - The associated numerical value is an estimated quantity between the detection limit and the quantitation limit.

TABLE 1A
Site Name
SPECTRACE 9000 XRF DATA (PPM)

ID	DATE	TIME	Sb	As	Ba	Cd	Ca	CrHI	CrLO	Co	Cu	Fe	Pb	Mn
S0FILLB1	8/25/2002	956	56 U	58 J	520	150 U	22000	640	270 U	400 J	38 U	22000	21 U	740 U
S0FILLB2	8/25/2002	1001	56 U	28 U	440	150 U	18000	430 J	590 J	260 U	38 U	16000	21 U	740 U
S0FILLB2D	8/25/2002	1007	56 U	28 U	620	150 U	17000	360 J	270 U	260 U	38 U	13000	21 U	740 U
S0FILLC1	8/25/2002	916	56 U	28 U	570	150 U	38000	290 J	330 J	460 J	38 U	17000	21 U	740 U
S0STGARA1	8/23/2002	1107	86 U	34 U	310	230 U	7200 J	680 J	570 U	350 U	49 U	20000	28 U	540 J
S0STGARA1D	8/23/2002	1117	86 U	34 U	360	230 U	7500	460 J	570 U	350 U	49 U	20000	28 U	690 J
S0STGARA2	8/23/2002	1128	86 U	34 U	300	230 U	6900 J	790 J	570 U	350 U	49 U	20000	28 U	590 J
S0STKPLA1	8/28/2002	1858	910	890	320	110 U	8200	360 J	730 U	540 J	70 U	37000	4800	2500
S0STKPLB1	8/25/2002	901	88 J	130	450	150 U	14000	420 J	270 U	300 J	38 U	19000	400	740 U
S400HT4Z4	9/20/2002	1521	55 J	35 U	450	180 U	20000	700 J	1100 U	540 U	67 U	13000	110	660 U

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TABLE 1B
 Site Name
SPECTRACE 9000 XRF DATA (PPM)

ID	Hg	Mo	Ni	K	Rb	Se	Ag	Sr	Th	Sn	Ti	U	Zn	Zr
S0041FC1S1	28 U	6.3 U	130 U	27000	120	8.1 U	40 U	79	11 U	130 U	2400 J	15 J	320	190
S0041FC1S2	28 U	6.3 U	130 U	28000	110	8.1 U	68 J	50 J	11 J	130 U	2400 J	19 J	150	180
S00FCCM1S2	28 U	6.3 U	130 U	28000	91	8.1 U	59 J	180	11 U	130 U	3400	12 U	340	240
S00FCCM2S1	28 U	6.3 U	130 U	22000	88	8.1 U	130 J	55 J	11 U	130 U	1700 J	12 U	4900	200
S01063W1Z1	28 U	6.3 U	130 U	21000	90	8.1 U	67 J	170	14 J	130 U	2500 J	12 U	270	240
S04002W1Z1	47 U	6.4 U	120 U	25000	92	27 U	64 U	200	11 J	100 U	2000 J	10 U	120 J	220
S04002W1Z1B	47 U	6.4 U	120 U	2800 U	23 U	27 U	64 U	25 U	8.4 U	100 U	1300 U	10 U	57 U	21 U
S04002W1Z1D	47 U	6.4 U	120 U	21000	75 J	27 U	64 U	190	8.4 U	100 U	1900 J	10 U	90 J	230
S04003E1Z1	47 U	6.4 U	120 U	23000	82	27 U	64 U	260	8.4 U	100 U	1800 J	10 U	300	200
S0400HT1S2	45 U	9.7 U	97 U	24000	91	23 U	180 J	68	12 J	90 U	1400 J	11 U	3100	150
S0400HT4Z01	45 U	9.7 U	97 U	26000	97	23 U	64 U	130	10 J	90 U	2100 J	11 U	6000	210
S0400HT4Z02	56 U	5.6 U	72 U	25000	110	25 U	89 U	71 J	8.4 U	81 U	1500 J	12 J	230 J	210
S0400HT4Z03	56 U	5.6 U	72 U	23000	83	25 U	89 U	78 J	8.4 U	81 U	1700 J	12 J	83 J	200
S0400HT4Z05	56 U	5.6 U	72 U	25000	81	25 U	89 U	110	8.4 U	81 U	1900 J	20 J	4100	210
S0400HT4Z06	56 U	5.6 U	72 U	24000	100	25 U	89 U	110	8.4 U	81 U	1700 J	17 J	220 J	220
S0400HT4Z07	56 U	5.6 U	72 U	21000	91	25 U	89 U	120	8.4 U	81 U	1200 J	11 U	290	150
S0400HT4Z08	56 U	5.6 U	72 U	27000	120	25 U	89 U	110	8.4 U	81 U	1300 J	11 U	81 U	200
S0400HT4Z09	56 U	5.6 U	72 U	23000	95	25 U	89 U	120	11 J	81 U	1500 J	11 U	84 J	170
S0400HT4Z10	56 U	5.6 U	72 U	23000	93	25 U	89 U	79 J	11 J	81 U	1100 U	14 J	97 J	190
S0400HT4Z11	56 U	5.6 U	72 U	23000	110	25 U	89 U	97	9.6 J	81 U	1900 J	11 U	450	200
S0400HT4Z12	56 U	5.6 U	72 U	23000	95	25 U	89 U	82 J	8.4 U	81 U	1400 J	11 U	120 J	210
S0400SP1Z1	28 U	6.3 U	130 U	22000	93	8.1 U	89 J	220	11 U	130 U	1300 J	12 U	130	210
S0401SP1S1	28 U	6.3 U	130 U	35000	77	8.1 U	220	79	11 U	130 U	1500 J	15 J	6000	170
S0401SP1S1B	28 U	6.3 U	130 U	3400 U	21 U	8.1 U	53 J	18 U	11 U	130 U	860 U	12 U	37 U	20 J
S0401SP1Z1	28 U	6.3 U	130 U	20000	76	8.1 U	73 J	220	15 J	130 U	1700 J	12 U	2000	180
S0407IH1A1	31 U	4.3 U	97 U	20000	98	23 U	90 U	160	11 U	65 U	2600 J	15 J	890	330
S0407IH1Z1	31 U	4.3 U	97 U	19000	94	23 U	90 U	220	11 U	65 U	2700 J	7.8 U	560	300
S0407IH1Z1B	31 U	4.3 U	97 U	3300 U	18 U	23 U	90 U	36 U	11 U	65 U	980 U	7.8 U	54 U	18 U
S0700FG1A13	31 U	4.3 U	97 U	23000	91	23 U	90 U	150	11 U	65 U	1200 J	7.8 U	2200	150
S0700FG1A3	31 U	4.3 U	97 U	32000	100	23 U	90 U	110 J	11 U	65 U	1600 J	12 J	4000	210
S0700FG1A6	31 U	4.3 U	97 U	33000	74	23 U	170 J	58 J	11 U	65 U	1900 J	10 J	4400	150
S0700FG1Z1	31 U	4.3 U	97 U	24000	110	23 U	90 U	84 J	11 U	65 U	1700 J	12 J	1100	200
S0700FG1Z2	31 U	4.3 U	97 U	23000	83	23 U	90 U	81 J	11 U	65 U	1500 J	18 J	4400	190
S0FILLA1	45 U	9.7 U	97 U	22000	92	23 U	64 U	240	5.8 J	90 U	2500 J	11 U	86 U	220
S0FILLA2	45 U	9.7 U	97 U	26000	87	23 U	64 U	250	11 J	90 U	2500 J	11 U	86 U	190

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J - The associated numerical value is an estimated quantity between the detection limit and the quantitation limit.

TABLE 1B
Site Name
SPECTRACE 9000 XRF DATA (PPM)

ID	Hg	Mo	Ni	K	Rb	Se	Ag	Sr	Th	Sn	Ti	U	Zn	Zr
S0FILLB1	31 U	4.3 U	97 U	28000	120	23 U	90 U	120 J	11 U	65 U	2600 J	15 J	110 J	240
S0FILLB2	31 U	4.3 U	97 U	26000	100	23 U	90 U	93 J	11 U	65 U	1900 J	16 J	60 J	200
S0FILLB2D	31 U	4.3 U	97 U	30000	100	23 U	90 U	140	11 U	65 U	1500 J	8 J	54 U	190
S0FILLC1	31 U	4.3 U	97 U	30000	97	23 U	90 U	62 J	11 U	65 U	2700 J	11 J	54 U	250
S0STGARA1	45 U	9.7 U	97 U	20000	110	23 U	82 J	130	7.7 J	90 U	2700 J	11 U	110 J	230
S0STGARA1D	45 U	9.7 U	97 U	22000	100	23 U	64 U	140	6.3 J	90 U	2600 J	12 J	92 J	250
S0STGARA2	45 U	9.7 U	97 U	21000	93	23 U	64 U	120	14 J	90 U	2500 J	16 J	110 J	240
S0STKPLA1	28 U	6.3 U	130 U	26000	88	8.1 U	40 U	130	11 U	130 U	2100 J	12 U	2900	190
S0STKPLB1	31 U	4.3 U	97 U	24000	93	23 U	90 U	120	12 J	65 U	1400 J	11 J	1100	200
S400HT4Z4	57 U	9.2 U	99 U	25000	91	28 U	120 U	170	15 U	110 U	1200 J	15 U	300 J	140

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J - The associated numerical value is an estimated quantity between the detection limit and the quantitation limit.

APPENDIX D

Street Codes for Sample Identification

Street	Code
1ST STREET	1S
2ND AVENUE EAST	2E
2ND AVENUE WEST	2W
3RD AVENUE EAST	3E
3RD AVENUE WEST	3W
3RD STREET	3S
4TH AVENUE EAST	4E
4TH AVENUE WEST	4W
4TH STREET	4S
5TH AVENUE EAST	5E
5TH AVENUE EAST	5E
5TH STREET WEST	FI
6TH AVENUE EAST	6E
7TH STREET	7S
ALDER STREET	AL
ALLEY BETWEEN 4TH & 5TH AVENUE	4A
ALLEY BETWEEN 5TH & 6TH AVENUE	5A
ALLEY BETWEEN ALDER & SPRUCE	SA
ALLEY BETWEEN PINE & SPRUCE	PA
ARIZONA AVENUE	AR
CALIFORNIA AVENUE	CA
CEDAR STREET	CE
CEMETARY ROAD	CM
CITY SHOP	SP
COUNTRY LANE	CO
DIAMOND ROAD	DI
ELEMENTARY SCHOOL	EM
EVA HORNING PARK	EH
FAIRGROUNDS	FG
FLAT CREEK ROAD	FC
HIGH SCHOOL	HS
HIGH SCHOOL TRACK	HT
ILLINOIS AVENUE	IL
IRON MOUNTAIN HIGHT	IH
IRON MOUNTAIN ROAD	IM
LITTLE PARK	LP
MAIN STREET WEST	MN
MAPLE STREET	MA
MONTANA AVENUE	MT
MULLAN ROAD EAST	ME
MULLAN ROAD WEST	MW
OLAD MULLAN ROAD	OM
PIKE STREET	PD
RIVER STREET	RI
RIVER STREET NORTH	RN
RIVERBEND ROAD	RB

Street	Code
RIVERSIDE ROAD	RV
RIVERSIDE ROAD ALLEY	RA
RIVERSIDE ROAD WEST	RW
RIVERSTREET/JOHNSON LANE OPENSACE	OS
ROBINS NEST LANE	RL
SHAW GULCH LANE	SG
SLOWAY WEST	SW
SOUTHSIDE ROAD	SO
SPRITIS WALK LANE	SL
SPRUCE STREET	SP
SUNNYSIDE LANE	SU
WESTFIELD PARK	WF

APPENDIX E

Bench Scale Stabilization Test Procedure

**Superior Waste Rock (ROS)
Bench Scale Stabilization Test Procedure**

Assumptions:

1. Excavated moist earth: 90 lbs/cu.ft
2. Portland cement: 94 lbs/cu.ft.

Background:

During removal activities, material which visually appeared to be contaminated was placed on stockpile A. All other material was placed on stockpile B. Samples were collected from both stockpiles. Samples were 15 point composite samples that were each homogenized before analysis. Both stockpiles were tested for total metals and TCLP to get more accurate values for characterization (versus the worst case TCLP samples collected previously). The field stabilization tests were completed on material from stockpile A only.

Procedure:

START2 collected approximately 10 gallons of soil from stockpile A. The material was collected from 15 different locations and homogenized to get a representative sample. Approximately 2 gallons of material was placed in each 5-gallon bucket (5 buckets total). A sample was collected from the control bucket (this is the stockpile A sample described in the background section). Based on assumption (1), 2 gallons of soil weighs 28 lbs. START2 used this value to calculate the amount of cement needed. This made the percentage of cement by weight a little less because it is based on the weight of the soil and not the total weight.

ID	Soil Weight	Cement Added	Total Weight	Actual % Cement
Control	28 lbs soil	0 lbs cement	28 total lbs	0%
7% cement by weight	28 lbs soil	1.96 lbs cement	29.96 total lbs	6.5%
10% cement by weight	28 lbs soil	2.8 lbs cement	30.8 total lbs	9%
15% cement by weight	28 lbs soil	4.2 lbs cement	32.2 total lbs	13%
20% cement by weight	28 lbs soil	5.6 lbs cement	33.6 total lbs	17%

START2 used assumption (2) to determine the volume of cement needed to add to each test bucket. These were 19, 29, 43, and 57 ounces of cement respectively. This was done because a scale was not available for the test.

START2 added the appropriate amount of cement to each of the 4 buckets, dry mixed the soil and cement completely and then added water and followed the same mixing procedure. The mixing procedure used a stainless steel spoon to disperse the cement and/or water into the soil

and then a lid was used to cover the bucket. The bucket was then rolled and flipped until the material was completely mixed.

Based on laboratory data from the site investigation, the soil in Superior had an average moisture content of approximately 12%. When completing the treatment test, START2 used 20 ounces of water to the 7% cement/soil mixture (this seemed like the minimum amount of water required to mix in with the soil/cement mixture). This calculates to about 17% total soil moisture.